AGRICULTURAL ENGINEERING

FEBRUARY 1943

THE JOURNAL OF THE AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

War Doubles Danger on Farm Front

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On the fighting front, casualties are the inevitable price of victory. On the food front, casualties are not necessary. They do *not* help to bring victory; they hinder it.

all the accidents to farm peo- nly a few occur while farming. thers happen in the home, on ighway, etc. Yet farming has ngers. Every year one farm in ten has some accident serious gh to lose working time and ere with production. We can't l that now.

out 85 percent of farm work ents are caused by *people,* only 15 percent by animals, lad- and other *things.* Among 200 ents studied in detail by the Equipment Institute, 90 per- were caused by human care- ess or mistakes; five percent due to mechanical failures uipment; and in the rest the s were not clear.

lders of farm machines devote care and considerable ex- to provide protection for operators. Power take-off shafts and universal joints are covered with shields. Silage cutters have safety controls for stopping and reversing the feed rolls. On Case tractors the platform, seat, levers and pedals all are arranged to guard the operator from slipping, falling, or other mishap.

But all this care by the builder cannot take the place of care by the operator. Only his caution can avoid the inherent dangers of sharp knives or sickles, revolving disks and power-driven rolls.

When inexperienced and perhaps impulsive people take the place of trained farm help, dangers double or treble. Accidents will increase unless you take care to teach the ways of safety, such as the simple rule that a machine must be stopped *and* out of gear before doing anything with or near its working parts. To help you do this we will gladly send you free a placard, "Don't Get Hurt," for you to tack up in your machine shed.

Accidents seldom occur with machines in normal work at the jobs they were built for. There is more danger when operators attempt to assist or adjust machines in difficulty. This danger will increase as old, worn machines cannot be replaced with new. Not only to save time and crops, but to save limbs and lives, keep your equipment in repair and in adjustment to work like new.

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Your Case dealer is more than a mechanic. By training and experience he knows the job each implement and machine must do in your soil and your crops, just how to adjust them for your conditions. Call on him for service . . . especially for repairs . . . in slack times when you can, in rush seasons when you must. Let his skill help you to speed and safety as you fight the battle of food. J. I. Case Co., Racine, Wis.

CASE

RVING AGRICULTURE *Since 1842* IN PEACE AND WAR

As a service to agriculture, this message is now appearing in farm papers. It is one of a series emphasizing the importance of safety as a means of conserving scarce manpower.

J. I. Case Co., Racine, Wis.

AGRICULTURAL ENGINEERING

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Vol. 24, No. 2

EDITORIAL

Thirty to One

LAST NOVEMBER I heard an address by Dr. Chang Lok Chen, in charge of the Chinese consular office at Chicago. It was in a private meeting of about a hundred business and professional men, so perhaps it should be classed as the private knowledge and judgment of Doctor Chen rather than an official utterance of his government.

Be that as it may, he reported that for five years China has resisted Japan, beginning almost barehanded and even now most meagerly equipped with the munitions of modern war, and despite the fact that Japan has had as many as 3½ million men in China. He said that China has five million trained soldiers in the field, with ten million more in reserve. According to Dr. Chen, China neither needs nor wants any military man power from us. Give her only the weapons and supplies of modern warfare and China alone is able and anxious to crush Japan completely.

Now that food has become a critical material, Doctor Chen's points fall within the purview of agricultural engineering. Being a hardy race, accustomed to work and fight on a low-level diet, and being able to utilize local foods to full advantage, it seems likely that three Chinese soldiers can be sustained with the ship tonnage that it would take to transport and provision one American soldier.

In food-producing capacity the American farmer probably is equal to ten Chinese farmers. Combining these factors, it appears that an American farmhand is worth thirty times as much in the home cornfield as on an Asiatic battlefield, provided of course that there are machines on the land and ships on the sea. If there are not, American soldiers abroad would be much worse off than native troops.

This brings us to shipbuilding and the manufacturing industry, which are beyond the domain of agricultural engineering. But if the boasts in behalf of American mass production genius are well founded, some similar ratio of superiority should prevail for ships and weapons as exists with food production.

As a matter of sheer engineering effectiveness it would appear that America should concentrate largely on the once-avowed objective of becoming the arsenal of democracy. This is particularly true as to that phase of the war involving the enemy which bombed the Hawaiians, occupied the Aleutians, took the Philippines, and shelled the coast of California.

WALTER B. JONES

Terracing Is Now Farming

FARM EQUIPMENT trade papers some weeks ago carried a story of a plow-built terracing contest conducted by the Mills County (Iowa) Soil Conservation District, whose members believe it to be the first such contest ever held, at least in the United States. In our opinion it is a landmark of profound significance in the history of soil conservation.

When farmers have developed sufficient interest and skill to engage in such a contest, it means that terracing has been accepted as a part of farming. When one contestant hauls his tractor and plow sixty miles to participate, and when the winner works with a farm tractor twelve years old, it means that both psychologically and economically terracing has arrived. Instead of waiting for Santa Claus to come along with a juggernaut to do the job, the farmer goes ahead and does it with his own farming implements.

While we have no intention of adding a sports department among these sedate pages, we believe agricultural engineers may well encourage the sporting aspects of these events. As coaches and officials for such contests they can promote good practice. They may even learn something about speed and efficiency in terracing with everyday tools. This is implicit in the circumstance that the winner finished ahead of time after building a terrace of more than twice the cross section built by the third and fourth place winners.

It might be well if some of the hoary and revered plowing contests which have largely outlived their significance should have a rebirth as contests in terracing, contour plowing, and other operations that must become a part of farm thinking if conservation farming is to prevail.

Machine Tools of Food Production

GEO. W. KABLE

THE public generally understands what is meant by machine tools for industry. Of course, crankshafts and airplane bodies and tanks could be hammered out, but in view of the war needs and the man power situation, attempted production without machine tools is ridiculous.

Plows, cultivators, mowers, combines, tractors, feed grinders, water pumps, brooders, milking machines are the machine tools of food production. Of course, food could be produced with spades and scythes, and chicks could be raised by hens in lots of 12 or 15; but, farm production now without "machine tools" is ridiculous.

The sooner war boards and the public generally look upon agriculture as one of the essential war industries requiring machine tools for food production, the sooner will the threat of serious shortages be removed. Moreover, farmers cannot go to Washington or Chicago to argue for these machine tools. They must be available at the points of need and through channels accustomed to handling machines and repair parts and keeping the equipment in running condition.

There are two classes of machine tools for food production, namely, field tools such as plows and binders and chore tools like milking machines and water pumps. Field tools have received the greater attention. They involve more steel, larger investment, and the more spectacular jobs of producing grain, forage, and other field crops. But are they more important?

At the A.S.A.E fall meeting in Chicago, H. J. Gallagher told of a situation on his own farm in Michigan which must be quite typical of many farms, judging from the many general farm sales and sales of dairy cows which have been taking place all over the country during the past year. The Gallagher farm, which has been operated by a tenant-partner for nine years, is well equipped with machinery. They milk 24 cows. In discussing the absolute equipment needs of the farm it was determined that the combine was used about five ten-hour days in a year. If it had been laid up a few days for repairs during harvest, they could have managed. They might even have borrowed or rented equipment for the entire harvest. Other tillage and harvesting machinery was in about the same class. The tractor was used some seventy ten-hour days in the year. It was *(Continued on page 38)*

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Wartime Responsibilities of Agricultural Engineers

By L. J. Fletcher

FELLOW A. S. A. E.

WE HAVE been in training for twenty-five years for our "Big Game" of 1943. Our playing schedule has included "Power Farming" during the first World War; the "Battle of the Corn Borer" and then "Erosion Control," and late in the season, under difficult playing conditions, a "Drive for Understanding" concerning the real benefits of farm mechanization and production efficiency.

The vital importance of our "Big Game" of 1943 is becoming most evident. The agricultural production of this country is vital for the continued successful carrying out of the war program of the United Nations. Nineteen hundred and forty-three will see a stampede to increase farm production.

We have recently witnessed a complete reversal of the *belief* held by many that obtaining the greatest results from the least input of time, energy, and materials was antisocial. Those who yesterday were blaming the machine for unemployment, will soon be pointing with pride to the machine as the miracle worker.

The Picture of 1943. We have a new style in national farm problems — more output rather than less. It is not difficult to decrease output by general centralized regulation and action. Increasing output, however, is not a matter of centralized regulation. It is not a wholesale job. On the other hand, increased output is a problem that must be solved on each individual farm. It depends upon efficiency in planning, utilization of man and machine power, and good management. Here's a challenge to every agricultural engineer — a challenge to his ingenuity — a test of his ability to use his engineering capabilities.

While accurate data is not available, of the approximately ten million people normally employed on farms in the United States from one-fifth to as much as one-fourth are now in our military organizations or employed in war industries. It is safe to say that 20 per cent of the experienced farm workers are not available for work in agriculture in 1943.

Farm equipment must be operated and maintained under a new set of difficulties, including inexperienced help and an increasing difficulty in securing mechanical service and repair parts. The supply of new machines is drastically reduced.

Many farmers will be growing new crops, crops with which they are unfamiliar. The experience of those in other parts of the country familiar with the handling of these crops will have to be brought quickly and effectively to the new producing areas.

Farmers, as all other people in this country, must work under new war regulations which influence transportation, employment, obtaining of equipment, and the like. Thus we have a typical engineering problem to produce more with less man power and less labor-saving equipment.

Prediction. I predict that 1943 will see the greatest avalanche of advice ever directed towards our farmers or any other group. Farmers will be receiving advice on how to produce more — on the radio, in the press, and from the platform. Hundreds of thousands of willing, yet most unskilled workers will flow onto the farms, many wishing to put in their "one day for Victory". Farmers will need plenty of aspirin.

Here's a challenge to every agricultural engineer whether in a university or in a manufacturing plant, in public or private employment.

How May We Serve in 1943? As to ways in which agricultural engineers may best serve in 1943, I have the following suggestions:

1 We must have confidence in our judgment and opinions. Now is no time to carry out experiments to perfect the last bit of a practice or device. We must take chances, shoot fast and as straight as possible.

2 We must use every qualified man who can help in this great task. We should forget now whether men are employed by private industries or public institutions. This is the time to work together and forget, if necessary, past policies and practices concerning cooperation. If the farm equipment dealer or a manufacturer's representative has the knowledge or skill needed in any community, public agencies must recognize this situation and accept his assistance in public and semipublic activities.

3 It is vitally important that we recognize and have confidence in the ingenuity and resourcefulness of the individual farmer, dealer, serviceman, and others involved. Let us weigh carefully all plans set to help farmers get their job done. There are some today who are planning to organize pools for use of farm equipment. This calls for securing extensive records and setting up centralized authorities to direct the time and place where all farm equipment in a community is to be employed. Let us just remember that farmers for generations have been voluntarily working together toward the most effective use of the equipment available in any community. Unless we are careful we can hurt more than we help.

4 The problem of increasing production, as I have said, is a local rather than a wholesale one. Find local needs. The millions of tons of farm products needed can only be secured by the increased production of a comparatively few bushels or pounds on each farm. Helping to insure the continued operation of farm machines is a real service. Help keep in operation, repair shops where broken parts may be welded, worn parts repaired by plating or welding and grinding, where spare parts will be properly stored and quickly delivered. Such activities as this constitute a real contribution to continued production.

Address delivered December 9, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. Author: Director of training, Caterpillar Tractor Company.

5 Let us discover and pass on the most effective farm practices wherever we discover them. Describe clearly just how jobs are done best on the farm and discourage needless or harmful, although well-meant, ideas.

How to Train the New Farm Hand. In my opinion, one of the greatest contributions which agricultural engineers can make in 1943 will be in the field of training of the new or green farm hands. It is logical that this training be carried out through our agricultural extension service which fortunately is already equipped to bring to farm people, everywhere in this country, new methods and new ideas.

A great and most effective training program has been carried on in the war industries of this country. It is known as "job instruction training" and is directed by the Training-Within-Industry Section of the War Manpower Commission. This simple although most effective plan has been perfected for the training of supervisors in the proper instruction of a new factory worker. Over 300,000 supervisors and job instructors have been given this training in the war plants in this country, plants in which are employed over 6 million workers.

THE SLOGAN IS: "IF THE WORKER HASN'T LEARNED, THE INSTRUCTOR HASN'T TAUGHT"

The factory foreman who is a qualified "job instructor" gives this training in four steps designed to (1) properly prepare the worker to learn the job, (2) properly present the operation, (3) try the performance of the new worker, and then (4) follow up. The slogan of this training program is "If the worker hasn't learned, the instructor hasn't taught." The key point of the program is that "telling is not training." In a letter from the Assistant Secretary of the Navy to C. R. Dooley, director of training within industry, occurs this statement: "It (job instruction training) is not a schoolroom method but one which every foreman and lead man can use daily in his job of breaking in new men and women and upgrading present employees to more responsible jobs. This program will, if properly applied, shorten the time for getting new workers into production, reduce spoilage, safeguard against damage to equipment, reduce tool breakage, and tend to reduce accidents."

I have discussed this program with people concerned with farm production. We are confident it can be modified to the end that every farm operator in one or two evening sessions could learn how better to give instructions to new farm hands. The result will be more efficient operation of equipment, less breakage and fewer accidents and injuries with attendant loss of time, and more productive results from the work done on farms.

This program of how correctly to instruct a farm worker was demonstrated before a group of critical farmers in central Illinois. A farm adviser stated that this program was the answer in his county to the serious problem of training new farm hands. He had been trying to work out a program of prefarm training but despaired of doing anything more effective than talking about the job. Now he saw the real objective was to give the farm operator an idea as to how to do a really effective job of training *his own help.* A dairy farmer stated that he knew he could do a far more effective job of developing interest on the part of new hands by properly showing them the important features of each job, and then to remember that if they do the job incorrectly it was likely his fault in not doing the proper kind of instructing.

Agricultural engineers may learn more about the industrial training program by getting in touch with the Training-Within-Industry Section of the nearest district office of the War Manpower Commission.

The War Activities Committee of the American Society of Agricultural Engineers is giving full consideration to this "farm worker instruction" program as an activity through which agricultural engineers may help to give tremendous impetus to increasing farm production in 1943.

So here is our opportunity and obligation. Every agricultural engineer in this country must accept the responsibility of aggressively developing the ways in which he will best serve his country in 1943. *More farm production* is the plea. Those words are our "marching orders".

Machine Tools of Food Production

(Continued from page 36)

important, but it could have been spared for a week for repairs if necessary. When it came to milking the cows, the electrically operated milking machine was used about three hours every day in the year, or the equivalent of 109 ten-hour days. The farm operator was no longer physically able to milk 24 cows by hand, and it was equally impossible to secure help. What would they do if motor trouble should develop which could not be immediately corrected? The answer was that within two days they would have to cut the herd down to eight or ten cows. The most probable market for the remainder was a Detroit slaughter house. Trouble with the water system motor would also be serious.

It is becoming increasingly difficult to buy new or used motors even for replacement. Motor repairmen and materials are hard to find, and delays are ruinous.

These farm chore tools are the ones that are helping produce the milk, eggs, meat, shearling fleeces, vegetables—the farm products most wanted for war. They are electrically operated tools for the most part. They include in addition to milking machines and water pumps, milk coolers, water heaters, stock water warmers, electric chick brooders and brooder parts, pig and lamb brooders, incubators, electric fence controllers, shearing machines, hotbed cable, and farm chore motors for such jobs as elevating grain and silage, hoisting hay, pumping irrigation water, operating shop equipment and grinding feed. Electric welders and particularly welding rods are going to have a lot to do with keeping farm machinery and equipment in use next summer.

It is high time that the machine tools of essential food production be classed as machine tools of a war industry and provision made for equipment of new plants and for quick replacements and repairs.

Soil Conservation in the War Period

By Hugh H. Bennett

IN THIS titanic struggle now enveloping the globe, agricultural engineering is presented with both the greatest opportunity and greatest responsibility in its history. Productive soil—the source of food and raiment—is part and parcel of the fight. Not only is productive soil fundamental to all survival and growth everywhere, but because it is the source of food, it is an indispensable weapon of the war. Agricultural engineering must shoulder a very large share of responsibility in determining how well this weapon is going to be used, how fully soil productivity is utilized and maintained—for the duration of the war and for the years that will follow. And, since soil conservation means increased soil productivity and increased per acre yields, and total production, the agricultural engineer working in this field is an indispensable part of our fighting force.

Like most wars, the present struggle has its roots in the economic situation, particularly in the need for food. Germany demands "lebensraum," or living space, which is only another way of expressing the biologic need for food and raiment. Italy takes over a large slice of Africa, and Japan grabs much of Asia and many of the Pacific Islands. Aggressive nations begin their machinations under the leadership of expert rabble mongers, who, playing upon unguided emotion, shriek for their self-determined share of the basic resources of the world. Such appeals, skilfully based on fundamental biological necessities—food, clothing, shelter—fall upon fertile ground. The bellowings for assumed national rights mount rapidly to fantastic assertions about natural spheres of influence, racial superiority, destiny. And then, suddenly, the raiding process begins—and war!

Address delivered December 9, 9142, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. Author: Chief, Soil Conservation Service, U. S. Department of Agriculture.

Democracies aim for security for all—a higher standard of living, opportunity, and justice to be shared by free men everywhere. The dictators seek total domination with slave populations forced to serve the so-called master race. We seek security through invention, ingenuity, and increased efficiency in the use of natural resources. Engineering, including agricultural engineering, is a fundamental force in all of these efforts for a better life.

In this war to the death between opposite poles of thought, every technical specialty, every iota of strength must be brought to bear in order to weight the scales for victory by the United Nations. Since food is so powerful a weapon, this means that every acre of productive soil must be made to yield its fullest. And this means that every acre must be used according to its capabilities, under a sound system of soil conservation. Recent experience throughout the country has shown that conservation farming means increased per acre yields, as well as increased per farm production. And experience has shown, also, that the techniques of the agricultural engineer, used alone and in combination with other techniques, is a basic tool of sound conservation farming.

If we are to attain fullest efficiency with total mobilization of all our resources, large-scale production must proceed without waste. Conservation of basic materials and efficient use of essential tools are functions of the farm no less than of the factory. And soil and water are the life-giving substances of the nation—tools for production, whether for war or peace.

Agricultural engineering proved its value in the all-time high of the 1942 harvest. In most cases, the goals for 1943 are even larger, and the pertinent specialties of agriculture must be prepared to meet an ever-expanding production schedule as the war advances. In other words, we have a difficult job—not merely for here and now, but also for years to come. After this global holocaust, much of the world is going to turn to America for food for existence. Our productive soil is going to be called upon to perform production miracles. It must respond to this urgent call to battle for national security.

And we are determined not to repeat the tragic experience of the last war. Then, American farming went on a food-production binge. Millions of acres of highly erodible land were plowed up. This undoubtedly was the world's costliest plow-up. The results were measured in a harvest of difficulties and disas-

A Georgia farm, near Royston in the Broad River soil conservation district, made over with soil and water conservation measures, both engineering and agronomic, that fit the area and meet the needs of the land for permanent agricultural productivity

ters: dust storms, farm migration, land scars that have not healed yet, and others.

Then not enough people fully understood the ruinous effects of uncontrolled soil erosion, and there was no nation-wide soil conservation program. This time we are wiser and we do have a far-reaching national program of soil conservation that is proving highly effective. And the program of research that supports this great effort has implemented our knowledge of agricultural techniques so that this time—today—in another world war we are ready.

Conservation is sometimes questioned on the basis of its long-range goals. In tense times like these, when the immediate need is so pressing, should we bother ourselves about the future? If conservation merely means saving, perhaps this will be another case of too little and too late. So runs the argument.

The answer is an emphatic contradiction. In the first place, conservation means using, not hoarding. When that use is wise and in accordance with the land's capabilities, within economic bounds and farmer capacity, soil conservation meets the situation. It seems not to have been fully understood generally that conservation farming means increased yields per acre, immediately as a rule; and, moreover, that it means protection of the soil and maintenance of its productivity for next year's needs—and for the needs of the future. It means also increased production per farm, generally, and increased total production.

Conservation, in fact, is the only way to meet the long-time as well as the immediate needs which this staggering conflict has dumped in our laps. Regardless of the military aspect of the picture—and no one is equipped to predict the date of the peace—the social and economic sides stretch far out ahead. When victory comes, indeed even while the war is in progress, we must feed not only our own, but the hunger-ridden masses of war-torn areas.

So the task now facing agricultural engineers and other specialists in the conservation field dwarfs any previous undertaking. The sheer physical side, in terms of tonnage of earth that must be shifted, outweighs by far all the soil movement involved in building the entire network of American highways. Highways are relatively straight and slender arteries compared to the task of treating the entire crop-producing areas for efficient conservation and adequate production.

The job is much greater than our present equipment in men and machines can meet. Trained personnel is far too meagre; many of our engineers already have been absorbed by the armed forces, and others are likely to be taken. Your entire organization—the A.S.A.E.—probably could provide no more than a skeleton force of what is going to be required.

Therefore, an immediate and pressing assignment falls to the educators. We must rely on the teachers to search out the most able of our young people and to prepare them as rapidly as possible for the many specialized demands in agricultural engineering.

It is a wide-open field, because agricultural engineering calls upon many sister techniques. The term is subject to broadest interpretation, involving pretty nearly everything which in some way means manipulation of the soil in order to accomplish an agricultural use. Biology, physics, chemistry, biochemistry, hydrology, aerodynamics, agronomy—all make their contribution.

As teachers or scientists, specialists in the various branches of the natural sciences can help meet this call of America's soil. Best use of the land can only be arrived at through a multiple attack: (1) A scientific analysis of the soil's potentialities and needs, (2) a sound technical program for practical management, and (3) execution of the program by agricultural engineers, crop specialists, soil scientists, and the six million farmers of America, in conformity with the requirements of the war and of continued soil productivity.

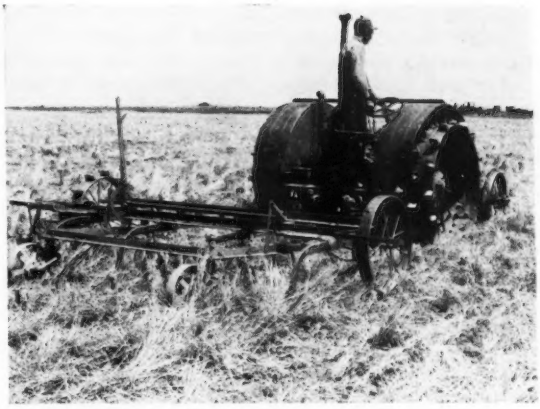
Agricultural conservation engineering will involve some reorganization of farming techniques on a great many farms, from the standpoint of power alone. The huge proportions of the war program for agriculture call for the speed of the machine. Mechanized farming, adaptably employed, will result in the tillage of more acres. True, the machine has sometimes been an instrument of destruction. The tractor has contributed to the spread of erosion on some lands. But to hold the machine responsible, rather than the hands that guided it, is equivalent to declaring that the airplane should be destroyed because it has been used for bombing.

No, we can't hold back the march of time, and need not if we learn to master the machines that are our own creation for our own advantages.

(Left) Thousands of stockwater ponds have been built by the engineers of the U. S. Soil Conservation Service. The sites have been carefully selected, with an engineering eye to usefulness and permanency and with due consideration of watershed conditions. This Kentucky pond is representative of many of those installed in the humid region. The dam is 12 ft high and 325 ft long. The spillway is stabilized with rock masonry and the dam with grass • (Right) The hydrologic work of the SCS engineers often leads to isolated areas: in this instance to the Seven Lakes snow course in Oregon where snow surveys are made so that farmers in the valleys below may be supplied with reliable information as to what the year's runoff may be. With such information they will know in advance how many acres they can safely irrigate

Efficient use of machines on farms helps solve several major problems simultaneously: Such use helps, for example, to make up the man power shortage; it simplifies some of the rather complicated techniques of cultivation, such as subsurface tillage and terracing; and it aids in increasing yields.

Under war pressure, agricultural engineering may be called on to design new machinery or to devise new ways of employing old types of machines. It may be called on to bring additional land into cultivation, as through drainage operations and preparing land for irrigation.



Plowing wheat stubble in western Nebraska, without turning everything under, so as to leave a protective cover of stubble mulch. This new method of plowing imitates Nature's way of conserving soil and rainfall. The agricultural engineer must develop new machines to help spread the use of this highly efficient conservation practice.

But this does not mean that soil conservation depends primarily on elaborate equipment. On the contrary, a variety of practices are available to every farmer, even if he possesses no more than one mule. Strip cropping, crop rotations, seeding of protective cover crops, improvement of pastures, and many other things can still be accomplished through the use of simple tools, and with light equipment. The pooling of resources through community action under the guidance of soil conservation districts recently has come to be a really important aid in the spread of soil conservation on farms of limited equipment.

Much already has been accomplished toward solution of the varied problems involved with carrying out the nation's huge soil conservation program, but not nearly enough. Investigations in the laboratory and at the experiment stations have extended our knowledge of the science and practice of soil conservation. The hydrologists of the Soil Conservation Service, for example, are cooperating with the state agricultural colleges and experiment stations throughout the country in search of new and more efficient methods for handling and utilizing rainfall. Suddenly the cantonments, airports, and other military installations and war factories have created new and sharply increased requirements for water supply. Our agricultural engineers are striving to make use of every practical method for maintenance of needed underground water supplies and for making the best possible use of surface waters. Extensive studies of runoff from fields and watersheds of varying physical characteristics, undergoing different uses, are under way. While awareness of the wasteful effect of uncontrolled runoff on water supply is by no means new, the specific area of study in the past has been, for the most part, within and immediately around the large cities. Today the significance of runoff in terms of water supply for farms is the object of special research. And the whole question of irrigation and drainage in relation to land management is involved here.

The Service is extending its snow survey in order to determine in advance the year's supply of water available for irrigation and power plants in dependent surrounding areas, for purposes of sound crop planning for the season ahead, as well as for determination of water power potentiality. We are studying water supply and irrigation needs in connection with the production of guayule for rubber. We are making careful inventories of available local water supplies from various angles to provide factual information needed in locating and extending manufacturing and other war activities.

A new engineering technique for dealing with the sedimentation of reservoirs may be of interest. While it is commonly understood that efficient soil conservation must be adopted over contributing watersheds in order to keep silt out of reservoirs, sedimentation is likely to continue so long as muddy waters enter reservoirs. It is expected that this new device, which provides for passing muddy suspensions through the dam, will prove helpful in those too frequent instances where such heavy underflows imperil storage capacity.

As the result of cooperative investigations carried on by physicists and hydrologists of the California Polytechnic Institute and the Soil Conservation Service at that institution, a simple technique has been devised whereby density currents, such as underflows of muddy water, may be released through special vents installed near the base of the dam.

The first practical application of this device is now under way in Maryland at the Brighton Reservoir on Patuxent River now nearing completion. Here has been installed for the first time in a major dam a series of silt undersluices specifically intended for the release of inflowing muddy suspensions which otherwise would eventually deposit their load on the lake's bed. We are looking forward with great interest to the actual working performance when the dam is completed. This reservoir, with a storage capacity of about 20 thousand acre-feet, will service approximately 100,000 people in the suburban area surrounding Washington, D. C.

Results accruing from studies of wind erosion are proving their practical value in the field of erosion control and prevention. Engineering studies of the forces involved in wind eddies have suggested the working out of several protective and corrective practices. Well known of course are the conservation cropping methods like strip cropping and forest and plant thatches designed to serve as windbreaks to hold the soil in place. Less well known are the techniques for controlling sand dunes. One instance is the utilization of wind to tear down the dunes and distribute the materials that compose them. Thus the winds that built these smothering, traveling dunes is now called on to dispose of them.

Relocation of the main line of the Santa Fe railroad tracks to bypass the area of inundation created by the great Caddo dam across the Arkansas River in southeastern Colorado involved a completely new technique in dune control—an engineering-agronomic technique. Relocation of the tracks on higher ground south of the river would have cost the federal government considerably less than relocation on the north side, according to construction engineers. But shifting dunes on the south side would be a permanent menace and cost to the railroad, involving removal of sand from the tracks, installation of sand traps, etc.—pointed out representatives of the railroad.

Finally it was agreed to undertake stabilization of the dunes. Accordingly, engineers went down to Dalhart,

Texas, where successful dune control had been carried out by the use of various engineering and agronomic measures, singly and combined. Thereafter one season's work, under joint direction of an engineer and a crop specialist, put most of the threatening dunes under control and showed how to complete the job speedily. It was done chiefly with grass seedings strategically located and protected from the effects of drifting sand by a scientifically distributed mulch of straw.

The railroad today runs through the dune area and the U. S. Treasury is better off by the difference in location cost as between the two sites—a sum estimated at more than a million dollars.

Another important field of engineering activity is the construction of reservoirs for livestock water storage, fish ponds for food, drainage, protection of inflammable peat lands by dyking and flooding, streambank protection by sloping, planting, installing jetties and piling, and even anchoring whole trees, branches and all, against the banks, to still the waters at critical points. Work of this kind adds productive areas to our war farm plant, and various activities along these and other engineering lines are continuing at the present time.

I think it would be interesting to point out that the work done by the CCC drainage camps brought back into use or improved the producing capacity of an estimated area of cropland amounting to 12 million acres. These added acres are of great advantage now in our efforts to meet the production goals for the war's demands upon the soil. And when the camps were dropped, some of the drainage projects fortunately have continued through the timely efforts of soil conservation districts.

MANY SCS TECHNIQUES ARE PRACTICALLY SYNONYMOUS WITH AGRICULTURAL ENGINEERING

The field of interest covered by the Soil Conservation Service is as wide as agriculture itself, and many of its techniques are practically synonymous with the term agricultural engineering. A host of procedures and accomplishments could be listed. Just a few more will be mentioned:

Use of the stubble mulch system for preventing erosion and increasing infiltration of rainfall is practically revolutionizing cultural practices in a number of large farming areas.

A very large increase in the use of kudzu is simplifying gully control work in the South; and, being a palatable legume, this vine is furnishing excellent grazing for livestock while improving the soil and protecting it from erosion.

Conservation and more productive use of grazing land by the use of a variety of engineering and vegetative techniques for utilization of surface waters has become a very fruitful field for supplementing grazing and irrigation activities on western farms.

Thus conservation engineering is in the war. And it is helping in a very large way with the all-important task of increasing the production of food, fiber, vegetable oils, and other products of the soil. This contribution is of further great advantage to the nation in that the production job is being accomplished with least possible damage to the soil: a highly important aspect of our war effort in that such conservation action will make it possible to continue to use our productive lands in high gear throughout the war, and after the war if necessary.

It should be pointed out that, regardless of the progress that is being made, the movement of technicians—agricultural engineers and others—into the military operations and war equipment industries has developed difficulties. Every one of the men, and more, was needed. But the fighting front is the first order of business from now until the successful conclusion of the last battle against the enemy, and every citizen and every activity must make the necessary adjustments to this imperative achievement.

I think perhaps some have overlooked the fact that food production is a vital part of the fight, and that farmers and those helping farmers are soldiers too. The Soil Conservation Service is making every effort to assist in the production of war crops without abandoning sound conservation principles and practices. We are succeeding, too. Assistance to farmers through the Extension Service, the Agricultural Adjustment Agency, and other agencies is helping. A special effort is being made to induce those farmers to whom technical conservation assistance cannot be carried at once to go ahead with the use of simple practices that call for little or no special technical help, but still contribute to increased yields on a safe-farming basis.

THE SOIL CONSERVATION DISTRICTS SPREAD TO 42 STATES MAKE IT POSSIBLE TO MOVE AHEAD

The soil conservation districts that now have spread to 42 states—821 of them comprising 478 million acres—in a number of ways are making it possible to move ahead. District supervisors, sensing the need for making use of every ounce of farmer-energy and effort, have swung into increased action throughout the land. One of the principal contributions from the districts arises out of the splendid accomplishments of small communities headed by leaders selected by the group members or the supervisors. These communities, or groups, usually composed of ten or a dozen farmers, up to thirty or more, living in a compact locality or a well-defined watershed, have gone into spirited cooperative action. They are helping one another get the conservation job—and all farm jobs—done on time. They come together in schoolhouses, farm kitchens, anywhere, to discuss their problems, both individual and common. Together they make provisional farm plans for conservation on their own farms and help their neighbors work out arrangements for their farms; and often do excellent jobs. In this way various phases of conservation work can get under way until the assistance of engineer, or agronomist, or soil specialist can be obtained.

In this way farmers work out really amazing plans for pooling their resources of equipment, power, and labor. Sometimes half a dozen farmers, or more, will be working another man's farm at the same time, in order to do on all the farms the things that could not be so efficiently done if they worked alone on only their own farms.

In many other ways the districts are helping. And various agencies are helping one another. These aids, together with every possible aid in every specialized field of agriculture, are keeping conservation going ahead. And that is essential.

Remember that work on land to keep the land productive makes it possible for human beings to enjoy, lastingly, the benefits of this basic resource, and brings people together perhaps more than any other cooperative endeavor of man. This is my observation from working across the years with various groups here in the United States, in Mexico, South America, and other places. I am convinced that in the struggle for adequate food—the thing for which man will fight and die for in a pinch quicker than anything else—there is opportunity for men working together throughout the world to *(Continued on page 50)*

Wartime Farm Building Construction

By C. L. Hamilton
MEMBER A.S.A.E.

THIS war will not be won by men in uniform alone; it is a war of all the people. It must be fought on every front—on land, at sea, in the air, in factories, on farms, and even in our homes. This means teamwork, contributions, and sacrifices by all. War changes the pattern of our lives, but it cannot change our way of life unless we are beaten.

American farmers have entered the war at top speed. They have just gathered the greatest harvest this country has ever seen. They have set new peaks, well above previous records for grain crops, hay crops, oil-seed production, sugar crops, fruits, and vegetables. Livestock, dairy, and poultry products reached unparalleled levels. Good weather and high yields contributed to the 1942 farm victory, but the pinch of wartime scarcities and restrictions was felt.

The real battle on both the military and home front is just beginning. Expanding battle fronts require an increasing quantity of materials of every sort. The problem of obtaining essential civilian supplies will steadily become more acute. There will be a drastic reduction in our standard of living. Luxuries are out, and many things we used to think of as necessities will disappear. We must be tough with ourselves in making wartime decisions on necessities. Home economies of all sorts will be used to release increased quantities of materials for ships, tanks, guns, and the thousands of other items on our war supply schedules.

Farmers therefore have a two-front battle to fight—the production front and the conservation front. They must produce required food with minimum labor, materials, and equipment. New machinery and equipment will be hard to get. There will also be shortages of labor, insecticides, fertilizers, nails, fence, lumber, and rubber. This means through hard times in the past. With proper leadership and the base essentials for production, their experience and the bare essentials for production, their experience and ingenuity should carry them through again.

Devising necessary substitutes or makeshift facilities and new uses of non-critical material to meet the needs of the times is a challenge to all agricultural engineers and a service badly needed by agriculture today. There is much to be done. It will require initiative, ingenuity, and a first-hand knowledge of essential farm needs. It may be difficult for those who have devoted their lives to better building or other farm improvement programs to adjust themselves to the times. They must abandon, temporarily at least, their cherished goals. They must establish new objectives, based on wartime essentials.

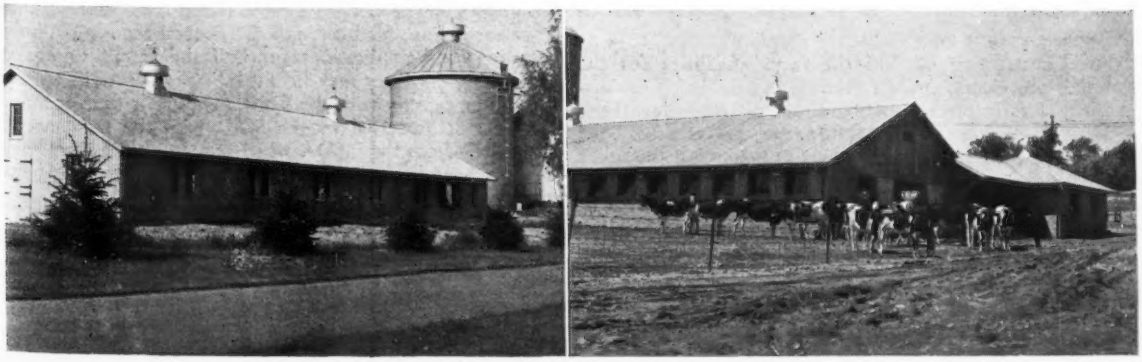
Wartime Construction Directive. With war, new construction steadily increased. During the first nine months of 1942 new construction in this country amounted to 10.5 billion dollars, compared with 8 billion dollars for the corresponding period of 1941. Many construction materials were being used faster than they could be produced. Withdrawals from stocks to meet deficiencies have reduced inventories to dangerously low levels. Copper and steel first became scarce, and now there is a shortage of lumber. To avoid a crisis, all construction had to be placed under rigid control. Building not essential to the war effort had to be sifted out and stopped. Construction essential to the war effort and vital civilian needs had to be reduced to a minimum.

Under present conditions, new farm construction cannot be justified because money is available, because materials have been accumulated, or because building improvements have been needed for some time. Since farmers have been able to get along with their present facilities, they are expected to continue to do so for the duration unless postponement of new construction would be detrimental to the war effort. Wartime essentiality and feasibility of renting, converting, or otherwise utilizing existing facilities must be fully explored before new construction is considered.

It is not intended to rule out essential maintenance and repair of existing facilities, emergency replacements of buildings destroyed by fire, flood, or tornado, and new construction or remodeling necessary to agriculture's part in the war program. Essential new facilities must be of the simplest type, just sufficient to meet minimum requirements. No possible economies of critical materials can be overlooked. Customary types of construction should be adjusted to make use of available materials.

To save nails and new softwood lumber, non-reinforced

Paper presented December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Illinois. A contribution of the Farm Structures Division. Author: In charge, farm buildings section, Division of War Board Services, U. S. Department of Agriculture.



Approval for new arm building construction is dependent upon two factors—its essentiality to food production and storage and the minimum use of critical materials and equipment

masonry materials and clay products should be fully utilized. Where lumber is essential, salvaged, homesawed or hardwood lumber should be used wherever practicable. Wallboards of fiber, gypsum, or cement-asbestos and composition roofing and siding provide desirable lumber substitutes. Such construction as basement dwellings, pole or straw sheds, and pit or trench silos, and buildings constructed of adobe, rammed earth, sod, or logs should be utilized to the fullest extent possible. War Production Board approval of new farm construction under wartime conditions is dependent upon two factors, namely (1) its essentiality to food production and (2) the minimum use of critical materials and equipment such as softwood lumber, electric wiring, plumbing, heating, and other metal equipment.

Construction Order L-41. The War Production Board has been struggling with all sorts of regulations, priorities, and allocations, attempting to conserve limited material supplies and turn them to the most urgent needs. Conservation Order L-41, issued April 9, 1942, together with supplemental amendments and interpretations, regulates civilian construction. It places all new publicly or privately financed construction under rigid control except for certain strictly limited categories. The order prohibits not only the beginning of construction in most categories, but also the purchase, sale, or delivery of any materials for use in such construction unless specifically authorized by the WPB.

As the order now stands it exempts the following farm construction, provided the materials can be secured without priority assistance, and upon completion the project will not require the use of any material to provide new utility services:

1 Ordinary maintenance and repair work needed to return the structure to a sound working condition without change of design

2 The reconstruction or restoration of "residential construction" damaged or destroyed after December 31, 1941, by fire, flood, tornado, earthquake, act of God or the public enemy

3 Construction of farm residences where the total cost is less than $200 over a 12-month period, beginning September 7, 1942

4 Construction of farm buildings, fences, and other facilities (except residence) serving a single farm where the total cost is less than $1,000 over a 12-month period, beginning September 7, 1942

5 Construction of irrigation pipe lines or drainage tile drains in which no materials except earth or other unprocessed materials and clay or non-reinforced concrete tile or pipe not more than 12 in in internal diameter, are incorporated

6 Construction of "off the farm" facilities for the storage, processing, manufacturing, assembling, or dispensing of farm products where the total cost is less than: $5000 for "industrial," $1000 for "other restricted", or $200 for "Schedule B" construction as defined in the order over a 12-month period beginning September 7, 1942.

The cost of construction is to include the total cost of labor and material, including fixtures, architect's, engineer's and contractor's fees, insurance charges, and financing costs except for the following items:

1 The labor of an owner or tenant and members of their immediate family residing with them is not included in the cost of construction.

2 Cost of excavation is not included where no material except earth or other unprocessed material is included. Where processed material is to be incorporated, the cost of excavation must be included.

3 Used or salvaged material including equipment is not included in the cost of construction provided there is no change in ownership. Neither is it necessary to include the cost of labor in incorporating such used material.

4 When a building is moved, neither the cost of severance nor the cost of moving is included, but the cost of constructing the new foundation, remodeling, and attaching the building to a new foundation are included.

5 The estimated value of homesawed lumber should be included in the cost of construction. This cost should be at least as great as the cash outlay in cutting, sawing, and preparing the lumber for use.

6 The only equipment to be included in the cost of construction are articles and fixtures physically incorporated in the building and used as a part of the building or items that cannot be detached without materially injuring them or the structure.

These are some of the more important features of Conservation Order L-41 as amended September 2, 1942, and the interpretations to date so far as they affect farm construction. There are many other details that cannot be mentioned here. Familiarity with details of the order come only through experience in handling associated work. It is indeed difficult to keep abreast of all the provisions and frequent changes in the construction order as well as all the other orders and directives that regulate the sales or use of construction materials.

Applications for Construction Approval or Priority Assistance. Applications for "on the farm" construction must be processed through the U. S. Department of Agriculture before they are submitted to the WPB. They are prepared on Form PD-200 revised and filed with the local county USDA war board. With the assistance of state and county war boards the wartime essentiality of each application is investigated, and only those recommended for approval by the Department (except for appeal cases) are submitted to WPB for final processing. Applications considered non-essential are returned to the applicant and transmitted to the WPB only when an appeal for reconsideration is made. To date it is estimated that fully 50 per cent of contemplated farm construction has either been informally discouraged or formally rejected by the USDA war boards.

Applications for other types of construction are filed through channels designated by the administrator of the L-41 Order. For example, applications for residential construction other than farm dwellings and multiple residential construction are filed through the Federal Housing Administration, and applications for "off the farm" storage or processing facilities may be filed through the USDA war boards or directly with the WPB. The latter type of applications are processed by the WPB with the assistance of specialists from the USDA when requested. Further designations have been made for filing other types of applications.

Softwood Lumber Order M-208. Conservation Order M-208 controlling distribution and use of softwood lumber affects the major part of the materials used in farm construction. The principal feature of this order is the division of all purchase orders for softwood lumber into four classes based on the relative essentiality of use to the war and civilian needs. It also specifies the types of lumber that can be used for various classes of construction. Classes 1 and

2 largely cover military or other directly related uses, which are assigned high priority ratings. Most of the essential farm uses are designated as class 3 construction, which is assigned an AA-5 rating. For example, construction to replace facilities destroyed by fire, flood, tornado, etc., and construction for storage of agricultural products or protection of livestock and poultry, together with maintenance and repair needs, are covered in list B of the order; all uses shown in list B are considered class 3 construction. Class 4 construction covers uses designated in list C of the order and carries an A-2 rating. The ratings automatically applied to class 3 and 4 orders can be used by the purchaser but they cannot be extended by a lumber dealer for the purpose of renewing his inventory. Dealers who need priority assistance to purchase softwood lumber may apply directly to the WPB on Form PD-IX. Only dealers whose inventory will serve important war or civilian use will be given favorable consideration.

It is significant to note that certain types of new farm construction such as dwellings and implement sheds are not included in any of the classes of construction established by Order 208. Priority assistance to purchase softwood lumber for dwellings or implement sheds can be secured only upon application and the establishment of the essentiality of the requested construction to the war program. It is doubtful if wartime justification can be shown for such new construction as implement sheds. While it is ordinarily considered good practice to house farm machinery, protection with paint and oil will probably suffice for the duration. It should also be noted that the use of hardwood lumber, ungraded homesawed lumber, or salvaged lumber is not affected by the order.

Plumbing and Heating Order L-79. Limitation Order L-79 regulates the sale and delivery of new plumbing and heating equipment necessary for civilian needs. The principal features of the order permit:

1 Sale of cooking and heating stoves and water heaters where the purchaser certifies that the equipment is needed in his residence and no other is available

2 Sale of any equipment to convert oil and gas burning equipment to the use of coal.

3 Sale or delivery of any item costing no more than $5.00 provided it is part of an order totaling no more than $10.00

4 Sale or delivery of equipment on an A-10 or better preference rating

5 Sale or delivery of equipment designed for medical or barber shop use

6 Sale or delivery of equipment if the purchaser certifies that it is required in construction specifically authorized under Conservation Order L-41.

In the majority of cases where new agricultural construction requires plumbing or heating equipment in excess of $10.00, Order L-79 restricts the sale of the required equipment to preference rated orders carrying a rating of A-10 or higher, or for construction authorized under Conservation Order L-41.

Other Related Orders. Several other orders affect farm construction or the sale of materials used in farm construction. The use of copper and copper base alloy is forbidden in building construction by Conservation Order M-9-c-4. This order does not, however, affect copper wiring. Limitation Orders L-218 and L-150 restrict or regulate the use of Douglas fir lumber and plywood in civilian construction. Order L-77 restricts the manufacture and sale of metal windows. Provision has been made, however, for release of inventory stocks when a rating is assigned. Preference rating order P-46 with amendments and administrative letters thereto provides procedure and regulations governing utility connections for gas, electric, water, and sewer. While some utility connections are permitted, the amount of pipe and wire that can be used is strictly limited. The use of the limited quantities of metal roofing and siding that can be manufactured is restricted to essential repair and maintenance by Conservation Order M-126. Supplementary Order M-21-b places certain limitations on delivery of black or galvanized pipe, farm fencing, gates, well casing, and similar items frequently used in farm construction.

While the manufacture of most metal items is controlled, certain items commonly used in farm construction have no special sales restrictions. The sale of nails, for example, is not restricted by any order, but the amount of materials that can be used in manufacturing nails is controlled and allocated to manufacturers quarterly. Such quantities of nails as can be manufactured are made available through regular trade channels. Ordinary hardware items are regulated in much the same manner.

The above orders, along with others not specifically referred to, are intended to curtail construction only in nonessential categories, and to channel the critical materials which they control, into essential war or civilian uses. The brief summaries of the orders mentioned in this paper are intended only to give a broad outline of the regulations that affect farm construction on the date of preparation. Many of the provisions of the orders mentioned are being amended from time to time and new orders may be issued at any time. Accordingly this paper serves only as a guide to established procedures and applicable orders affecting wartime farm construction.

ADDENDUM

Since the foregoing was prepared, an amended Softwood Lumber Order M-208 was issued January 12, 1943, which includes several changes favorable to agricultural needs. It provides higher ratings for lumber required for essential agricultural uses and removes the previous inventory replacement restrictions. This change is expected to be particularly helpful in maintaining inventories of dealers furnishing lumber for essential farm needs.

Attached to the revised order are four lists carrying preference ratings for specific lumber uses based on the relative importance of these uses in the war program. These ratings may be automatically applied by the purchaser and extended by the dealer for replacing inventories.
The amended order assigns a preference rating of AA-3 to:

Maintenance or repair of:

1 Farm buildings other than dwellings.

It also assigns a preference rating of AA-4 to:

Construction of:

1 Buildings, structures, and parts thereof, to replace those destroyed or damaged by fire, flood, earthquake, tornado, act of God, or the public enemy.

2 Buildings and structures required for storage of agricultural products produced by farmers, planters, ranchmen, dairymen, or nut or fruit growers.

3 Shelters, barns, pens, and sheds for livestock or poultry, and agricultural fences and gates.

Maintenance or repair of:

1 Dwellings.

C. L. HAMILTON

Efficient Farm Buildings A Wartime Need

By Hugh Curtis

FARMERS out on the food line today are trying to make production goals predicated on labor, fuel, equipment, and shelter that are now sadly deficient. As a basis for my contention that there is need for additional farm shelter NOW, I submit Table 1 showing 1942 production and 1943 production goals, scanning of which will show in what crops and livestock divisions the greatest increases have been scheduled—and, in direct proportion, where the services of agricultural engineers are most needed.

TABLE 1. 1942-1943 AGRICULTURAL PRODUCTION AND PRODUCTION GOALS

Commodity	Unit	1942 (Estimated Output)	1943 (Goal)
Chickens	Million pounds	3,118	4,000
Corn	Thousand acres	91,098	95,000
Wheat	Thousand acres	53,427	52,500
Soybeans for vegetable oil	Thousand acres	10,900	10,500
Potatoes	Thousand acres	2,845	3,160
Hogs	Million pounds	10,800	13,800
Cattle, calves	Million pounds	10,160	10,910
Milk	Billion pounds	120	122
Eggs	Million pounds	4,414	4,780

Assuming that the 1942 livestock population and grain production have brought about fairly cramped quarters and that because of rapidly diverted materials the building industry has little more than kept pace—there is every indication that it was able to do less—we then have a perfectly "full house" situation.

Upon this full house I will project the additional swine population figured from the poundage data for 1943 against population for 1942—to prove my premise of need for minimum housing. We want 3 billion more pounds of pork (in addition to the already considerable goals of 1942) which would require 1,395,000 more porker families, each consisting of a 400-lb sow and seven pigs raised at least to the 250-lb finish. Assuming that each family needs the equivalent of 42 sq ft of reasonably sanitary, weather-tight floor space, we have a need for an additional 58,590,000 sq. ft. Of course you must grant me the full house—the fact that 8 million more hogs are on the farm than we had a year ago, all filling the national hoghouse close to bursting. This is the condition almost any way you figure it and with pretty nearly any commodity, be it pork or beans. If the pigs are raised to 300 to 350 lb there will be a need for 1,200,000 families. Cut that in half and you still need 600,000 new A houses or their equivalent.

I don't maintain that merely providing pig shelter will solve pork production; there is still to consider man power, feeds, equipment, veterinary care, time. But unless we relieve as best we may the livestock housing shortages, we are inviting disease outbreaks and performance failures that next winter will make us take *two* notches in our belts. I claim that herein is opportunity for agricultural engineering ability.

There is opportunity to consolidate existing research data; to gather up stocks of leaflets, plans, bulletins, etc., and push them hard through the regular extension channels and through lumber dealers. The farmer, woefully short of help is looking for quick, inexpensive, non-critical methods of construction and repair and maintenance. *It follows that, where prepared material is found to be lacking or sadly out-dated, intelligent planning for future research and publication should be begun.*

There is a stimulus to explore hitherto somewhat neglected subjects such as home-sawed, heavy dimension lumber—to release whatever data is available, and to set up county clinics on its preparation and use. There is opportunity to get out more mimeographed plans which are flexible enough to make possible the use of odd stock remaining in lumber dealers' yards. And in this connection there should be a careful cataloguing and consistent use of the plans and bulletins of commercial building material manufacturers who are now continuing their research in non-critical as well as standard building materials.

In every state an acceleration of the present clinics on concrete floorings, mangers, walls would be an opportunity to forestall in part the sanitation difficulties that are sure to arise as animals and poultry crowd into old buildings. Five thousand new feeding floors went into 30 southern Minnesota counties in 1942. Your (the agricultural engineer's) job was to see that they went in right and will last. Did you do it?

Several outfits are experimenting with brooder houses which do not carry a wood flooring, thereby reducing the percentage of tongue-and-groove. And the possibilities of compacted straw flooring, of gravel-float flooring over which straw is laid, of built-up litter flooring (providing disease precautions can be met) and of sand flooring should not be neglected. Letters from our readers show that those agricultural engineers who have been issuing instructions for baled-straw and wadded-straw walls are meeting a need for practical, temporary makeshifts. There is opportunity to instruct in the use of salvage material; and such use will clear the way for the *better* and *permanent* buildings we know will follow after this conflict is concluded. Salvage clinics of county or township scope would be a real service.

For those in the engineering departments of manufacturing concerns and of agricultural colleges, there is opportunity to extend your services through questions-and-answer departments carried on by mail. Intimate that such service is available to the farmer plagued by problems of repairing, remodeling, building with unfamiliar, wartime substitutes, and questions will come rolling in. We know because we have a man who is busy all the time answering subscribers' letters on everything from building wooden latches to water-proofing basement barns. I feel confident that building clinics by mail can be depended upon to bring back that nervous indigestion and haggard look that were the badges of the farm structures man a year ago.

There is opportunity to give paints and preservatives the everlasting selling they deserve and to watch their performances for future recommendations. And here let me say that materials testing of all kinds must not lag. Test structures and materials are of relatively unimportant volume and require in many instances relatively little time. Control agencies of the federal government must be shown the need for continual research.

There is opportunity to maintain, repair, and even do some new building, hampered only by lumber shortages. (The present $1000 allowance on service buildings for any 12 months period is $917 more than the average farmer spent on service buildings in the highest building year of the last forty.) I don't mean to boom building now at the

Paper presented December 7, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. A contribution of the Farm Structures Division. Author: Associate editor, Successful Farming.

expense of the war effort; I mean to boom only building which contributes to that effort. I believe additional material *will* be available for this necessary farm building, and in that connection I quote from a letter from Arthur Upson of the lumber division of the War Production Board:

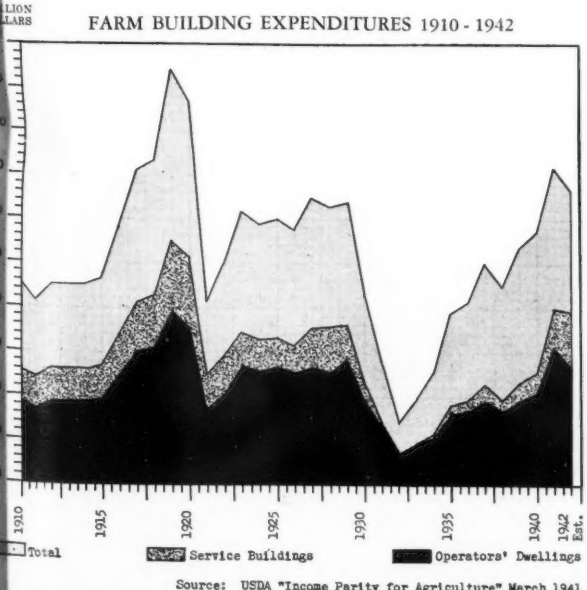
". . . The volume of military construction, and hence of lumber buying, reached its peak in the third quarter of 1942, and from now on it will gradually decrease so that by the end of 1943 it will have diminished to more than half of its peak. By military construction I mean troop housing, aeronautical facilities, dry docks, etc., publicly and privately financed defense plants, and housing for war workers. This prediction you will realize is based on presently scheduled building plans and military strategy. No one can tell what may come up that would substantially affect the presently indicated future construction program.

"Generally speaking, I believe that ordinary construction lumber, that is, inch boards, 2-in dimension, and such items as flooring, siding, and ceiling will be the first items that will begin to become more plentiful. This, of course, is the type usually used for agricultural structures. I hope this situation will fully materialize because I realize the importance of the use of lumber on the farm."

Up to this point I have been surveying emergency needs, the needs of a 1943 sure to be filled with short food bins and shorter civilian tempers. The picture is necessarily confused, but there seem to be things that engineers *can* do, both to make the most of what we have and unemotionally to present to war agencies *what we may need as the months go by.*

Now what about the needs and opportunities of 1944 if the war is drawing to a conclusion then—or the year after that, or after that?.

The first practical consideration in determining the opportunities for the future is again needs, markets. May we expect a considerable market after the war? In answer, the accompanying chart gives the pattern of the 'teens and 'twenties. There is no reason to believe that the pattern will differ after this war. In fact, due to a lag brought about by materials shortages which we did not have in the last war, it will undoubtedly be accelerated—and to that shortages factor add the war bond savings factor and the enforced savings factor, both of which will create a prefinanced demand for your engineering services and goods.



Source: USDA "Income Parity for Agriculture" March 1941

This chart gives the pattern of farm building expenditures prior to and following the first World War

Granting a demand, what forms may that demand take? I submit here a list of things that farmers were planning to do just before we entered the "defense" stage in our war effort. The following tabulation is taken from the 472 questionnaires sent to a representative cross section of our building contest entries:

DEMAND PATTERN FOR NEW AND REMODELED FARM BUILDINGS

(Taken from questionnaire sent to first 472 entries in Successful Farming's Building and Remodeling Contest)

OF THE 777 PROJECTS, 117 FAMILIES WERE BUILDING NEW FARM HOMES

	Per cent		Per cent
With two rooms	2	With eight rooms	9
With four rooms	15	With nine rooms	2
With five rooms	22	With ten rooms	1
With six rooms	36	With eleven rooms	1
With seven rooms	12	Total	100

284 REMODELING FARM HOMES

Outside of House

	Per cent		Per cent
Painting	48	New roof	36
Adding bathroom	46	Wood shingles	16
New siding	37	Asphalt	13
Clapboard	16	Asbestos	11
Asbestos shingles	5	Metal	2
Wood shingles	5	Composition	2
Brick	5	Slate	1
Stucco	1	Type not given	2
Sheet metal	1	Adding other rooms	32
Asphalt	1	One room	11
Rock	1	Two rooms	13
Stone	1	Three rooms	5
Type not given	2	Four rooms	2
Remodeling porch	35	Five rooms	1
Cement work	33	Not stated	2
Adding porch	27	Brick work	13

Inside of House

	Per cent		Per cent
Paint walls and woodwork	56	Install new basement heating plant	33
Remodel kitchen	55	Warm air	26
Install water system	52	Hot water	3
Paper walls	49	Steam	2
Install kitchen sink	46	Type not given	4
Finish basement	36	Refinish floors	27
Remove partitions	36	Wire for electricity	27
Install storm doors, windows	34	Install insulation	26
Install electric fixtures	32	Install weatherstripping	18
Lay new floors	32	Build fireplace	13
Add partitions	28		

348 BUILDING NEW SERVICE STRUCTURES

	Per cent		Per cent
New barns	29	New brooder houses	5
New poultry houses	39	New outside toilets	3
New garages	22	New work shops	3
New sheds	21	New smoke houses	2
New corn cribs and granaries (combined)	12	New sheep houses	1
New granaries	6	New silos	1
New hog houses	5	New wash house	1
New milk houses	5	New well house	5
		New cave	5

246 REMODELING SERVICE BUILDINGS

	Per cent		Per cent
Barns	66	Brooder house	3
Poultry houses	25	Sheep sheds	2
Sheds	18	Well houses	1
Garages	12	Greenhouses	1
Corncribs	10	Silos	1
Hog houses	10	Workshop	1
Granaries	9	Blacksmith shop	1
Milk houses	3		

I believe we can do something—many things—now that will enable us to be ready for the delayed demands when they materialize. The pattern may vary slightly from the figures shown above but the demand in total will increase.

I liked what Henry Giese said about standardization, because that in my opinion is the kind of hard-headed planning that needs to be done. The standards as recommended by the members of this Society will be of value only if based upon the hard dollar value of animal and poultry performance. But I want to warn that in some cases it would be possible to avoid overinvestment so scrupulously that disease factors would be overlooked and eventual cost would be far greater than an *(Continued on page 50)*

Machinery Problems in Peanut Production

By W. E. Meek

FELLOW A. S. A. E.

PEANUTS ARE an old crop given new prominence during the war emergency by the increased demand for vegetable oils. The growing of peanuts is widely distributed throughout the world with the United States ranking about fourth or fifth in production. With our expanded acreage program this ranking has undoubtedly improved. In this country we find two main sections where peanuts are grown extensively, viz: the southeastern states from Virginia to Alabama and the Southwest, principally Texas and Oklahoma. Conditions in these two sections vary widely due to climatic conditions, soil types, general farming practices, and to the likes or dislikes of the farmers.

Three main types of nuts are grown. The Virginia or Jumbo which is primarily for human consumption, and the Runner and Spanish. The latter is to be preferred to some extent for oil and consequently has the largest acreage.

Cultural and harvesting methods vary with the soil and weather conditions and with the farm practices common to the territory. The problems incident to growing and harvesting peanuts are not at all new, but it has only been comparatively recently that the crop has attained importance enough for real consideration to be given it from a standpoint of machinery or research. One of the greatest handicaps for the designer of peanut machines is the fact that there is practically no experimental or research data available from our colleges and experiment stations. This is particularly true of harvesting. They should not be censured for this for the crop has not previously been of great enough importance to warrant any extensive programs. Goobers, monkey nuts, ground peas, penders, or just plain peanuts, whatever you may care to call them, present many unsolved problems to the farmer and the implement designer.

In the matter of power requirements for peanuts, it is well to consider first that no specialized equipment of note is used in making or harvesting the crop with the exception of the picker or thresher. These machines are well developed and do their part of the job admirably. Throughout the culture and harvesting of the crop the farm machines common to the territory are used with occasional modifications. There has been developed a number of diggers, but these are usually made for specific local conditions.

Naturally any changes in the power and equipment used for this crop will be tractor power, and with the curtailment of production of both tractors and allied equipment for the duration there is little hope for any reduction of the power and labor requirements.

The peanut section of the Southwest was first mechanized as here machines for the usual field crops were developed much sooner than like equipment for the Southeast. It was only after the introduction of the light rubber-tired tractors and their allied equipment, principally the combination of cultivator, planter, and fertilizer attachment, that the tractor really became a general-purpose machine in the Southeast. For the duration farmers must do as best they can with the equipment which they now have both for peanuts and other crops as well.

Power requirements for the growing of peanuts may be divided into five operations. In some of these there is no problem as the existing machines do an excellent job being used for all crops grown by the farmer. Others do present most serious problems. The operations are: (1) seed bed preparation, (2) planting, (3) cultivating, (4) harvesting, and (5) picking or threshing. A sixth classification (processing) might be added but that is done in the same plants that process cotton seed and soybeans. It is also beyond the scope of this paper.

Seedbed preparation is done with the tillage tools common to the territory. All types of plows, harrow plows, and heavy disc harrows are used, the land usually being flat broken and prepared very much as for any broadcast or close-drilled crop. There is no problem of machinery here.

Planting is done with the ordinary cotton and corn planters used in the territory. In the Southwest the regular hopper is used with the addition of a peanut attachment which consists of special plates, cut-offs, etc. In the Southeast the farmers prefer the gravity drop or duplex type of hopper, which they also use for their other crops besides cotton. The nuts are planted both in the shell and shelled. With high-speed tractors and the farmers insisting on using these high speeds for planting, quite a problem is presented particularly with the shelled nuts as they must be handled very gently to prevent injury. With a little common sense the farmer will have no trouble in planting with machines now available. The nuts are planted from a rather deep trench or water furrow to the flat and even on a slight bed. The spacing in the drill varies from 2 to 4 in for the Spanish and from 6 to 14 in for the runner peanuts. Row widths vary greatly and are to a large extent predicated upon the widths in which other crops are planted. In the Southwest we find the rows are from 38 to 42 in, the same spacing as is used for cotton and the other crops grown. In the Southeast Spanish peanuts are usually planted in from 18 to 36 in rows, with a spacing of from 26 to 30 in being the usual width. Runner peanuts require more room and are planted in rows from 30 to 40 in with a spacing of from 32 to 36 in being more common.

Fertilizer is little used and there is little or no data available on its use. The present fertilizing equipment is so designed that it will handle the fertilizer at the time of planting or later as a side dressing. In fact, the farmer can deposit his fertilizer just about as he wants to with the modern fertilizer attachments.

For cultivation the common tractor cultivators are used with slight modifications for row widths in some cases. These modifications usually consist of arrangements of shovels or tool bars and are made locally. The shovels and sweeps common to the territory are used. The spring-tooth weeder and the drag harrow are used for the first two cultivations which are done broadcast, and after that the row cultivators are used. The nuts are laid by either on the level or with a slight bed or ridge.

Up to this point in the life story of the peanut we have few if any problems, but now we come to the important operation—harvesting. Here we have problems and head-

Paper presented December 9, 1942, at the fall meeting of the American Society of Agricultural Engineers, at Chicago, Ill. Author: Special representative, tillage and seeding machine sales, International Harvester Co.

aches. Harvesting is divided into three operations, namely, digging, shaking, and stacking or bunching. The peanut while a legume, is one of the worst soil depleting crops that the Southern farmer grows for all of the plant is removed from the soil, even the stems and leaves which are baled for hay. It is best, therefore, in digging to cut the tap root slightly below the wad of nuts so that the greater part of the root will be left and with it the nitrogen containing nodules. In the Southwest the farmers plow the whole root out so as not to lose any nuts. This is not good practice.

The Southwest handles their problem of harvesting very well with the available equipment, and it has fewer problems than does the Southeast. We find that the fields in the Southwest are clean and the rows wide apart. It is possible to dig with a variety of sweeps attached to middlebreaker beams or to the cultivator feet. The shaking can be done very well with the side-delivery rake and the bunching is done from the formed windrows with a fork by hand. These bunches are about the size of a bushel basket. Because of the lightness of the crop to be handled, the machinery outlined above is very satisfactory, but in the Southeast it is a very different story.

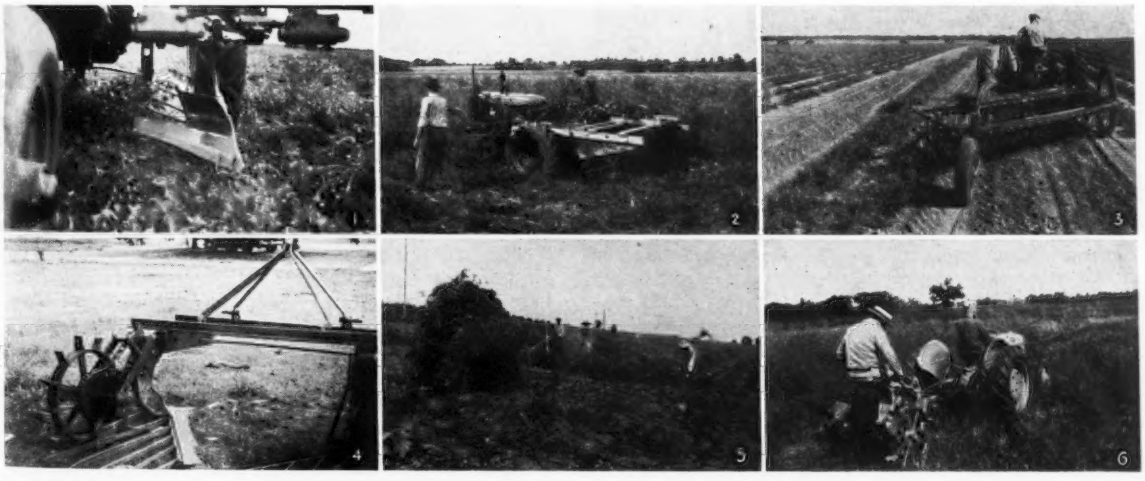
For digging we find the farmers using everything from a half sweep on a single stock, on through the various plows with the moldboard removed and with a wide or peanut share, up to the walking, riding, and tractor cultivators with a variety of blades, sweeps, and contraptions of wonderful design. Recently a tractor cultivator attachment for digging peanuts has been made available that seems to solve the digging problem very nicely. This attachment consists of a blade running at an angle to the row and under the nuts. It is attached to the cultivator gangs and is, in fact, a modification of the bean harvesters that have been used for many years. This attachment is simple, durable, and low in upkeep and first cost, all of which are requirements for peanut machines. Then, too, this attachment does not clog as badly as most diggers. The foreign vegetation in the peanuts makes clogging a very serious problem in the Southeast.

Shaking has been and is being done by hand. This operation consists in lifting the vines and shaking the dirt from the nuts after which they are piled, usually on poles, for curing. This curing period is from ten days to several weeks depending on prevailing weather conditions.

There have been a number of combination diggers and shakers manufactured and several are offered for sale at this time. They usually have several disadvantages such as high initial cost, high upkeep, clogging, power required, and the fact that they are one-row, two-man machines. They usually do an excellent job in the territory where they are designed. When moved to other territories the results are not always satisfactory. Probably the most popular of these machines is the modified potato digger type. In some cases the elevator is left off, and while this eliminates clogging to some extent it also practically eliminates any shaking action. When the chain is used, a great quantity of dirt must be moved so that separation occurs high on the elevator. When the dirt is removed from the nuts, the vines become light and will allow the chain to pass underneath without moving along with it. Another machine substitutes banks of wheels with fingers for the chain. This machine does a most excellent job where the fields are clean but clogs badly with grass or trash to say nothing of vines and clovers. This past year a tractor-mounted digger was offered for sale that had digging blades somewhat similar to the attachment for tractor cultivators and with a vibrating grill attached to the rear of the blade for shaking. This machine like the others works well under certain conditions but has the same disadvantages.

Work is being carried on to develop for the tractor operations a series of machines which will do all the jobs of harvesting at one time through and with one man. So far there has been little or no success except for digging and shaking. Experiments are continuing and it is hoped that outfits will be made available in the near future that will dig, shake, and bunch peanuts satisfactorily with a low-cost, simple, and long-lived machine. Industry and the state and federal agencies are pooling their resources in an effort to solve this problem.

Picking or threshing is done by simply feeding the vines with the nuts attached into the picker or thresher. The nuts are separated from the stems and are usually sacked, the vines and leaves dropping from the thresher to the bale chamber of a hay press where they are baled



These pictures show equipment for harvesting the peanut crop. (1) A peanut digger attachment (with experimental moldboard and fingers) as used on a cultivator. (2) Tractor cultivator equipped with peanut digger attachment and homemade shaker on the rear. (3) Side-delivery rake at work in Spanish peanuts. (4) A two-row peanut digger with vibratory shaker grill made for Ford tractor. (5) Stacking runner peanuts in Alabama. (6) A potato digger type of peanut digger in operation

for hay. In this field it is possible and would certainly be most desirable for some sort of attachment to be made available for the combines so that the vines could be picked up from windrows and threshed as the machine moves along. This would eliminate practically all of the hand labor now necessary for the crop. Such a proceeding will, I believe, have to wait until experimental data is made available on the curing of peanuts in the field. Little work has been done on this problem and any method used that digresses from those in use for many years is a risk. We do know that this past year in Georgia and Alabama some farmers cured their peanuts in windrows left by the side rake very satisfactorily. This was not from choice but rather from necessity as they could get no labor to stack the crop and had to use whatever means was at hand. This year the weather was right. Possibly next year with a few more rains they will lose their crops by the same method of curing.

Research and experimentation coupled with a lot of hard work will solve the problems of peanut growing. Of this there can be no doubt.

Efficient Farm Buildings Are a Wartime Need

(Continued from page 47)

additional sanitary floor or piping for a water supply. Let's not cut too close!

The setting up of a universally recognized group of standards by agricultural engineers is basic. The next step is a universally recognized set of outline plans incorporating such standards. We as editors would like to see such a variation of the Midwest Farm Plan Book, greatly enlarged and brought up to date, with regional editions. If we could have such area (not necessarily detailed) plans as nuclei around which to build the advances in individual college and commercial research, we would find ourselves in a common territory eliminating confusion to those to whom we speak, the farmers.

I feel that another postwar opportunity is a functioning rural-structures-inspection-and-codes board with members made up of rural leaders, insurance underwriters, livestock sanitary authorities, government agents, etc. Such a board might be national, administering general standards, and have its state and local boards follow suit. I believe such boards in the states and communities should have the power of condemnation or at least of restriction in so far as delivery to inspected markets goes. I don't mean this as a work-creating group for builders, but I do mean that we have an oversupply of no-account structures in service on farms today and that we would be wise to black them out while the blacking out is good, namely, in a period of high farm income such as we may expect for several years after the war.

In the recommendations for replacement made by boards of this type and the entire engineering fraternity, following standards and symposiums of plans, there should be a recognition of functionalism and, above all, flexibility, especially as they apply to mortgaged places or to those having absentee owners. One of the things that we see continually is the necessity of changing buildings completely or limping along with inadequate buildings whenever the ownership of a farm changes or financial systems dictate that the pattern of farming should change.

I think one of the outstanding opportunities of the future which should be planned for today is the need existing for a board of materials review. I have in mind a board functioning as a cooperative effort between agricultural colleges and the engineering departments of building materials manufacturers. I do not mean that this should become a Consumer-Research sort of thing, but that it should be a policy board just as we have a "house policy" board within our publishing concern. At the grass roots, the heads of agricultural engineering departments should get their men together in agreement, backed by test and research, on the various materials and complete structures constantly offered to the public by commercial concerns, by industry groups, and by their own colleges (which, by the way, are wonderfully prolific but not so wonderfully cooperative when it comes to "swapping" data among themselves.)

Recently I ran into a case where a man in one department damned a specific product while the man across the hall in the livestock extension office praised the insulating qualities of that product to the skies. I made the mental note that the first man had had his toes stepped on by some representative of the manufacturing organization, but we must remember that the farmer who comes in for information is not particularly sympathetic about squashed toes. For heavens sake, let's get together; tell one story and promote one thing—efficient farm building!

In conclusion, it isn't difficult to become enthusiastic about the future of agricultural engineering and of farm structures. Let us imagine your group six months after the conclusion of hostilities: You have at hand the set of standards for permanent structures to serve as building units and foods factories for world rehabilitation. You have the chance to redesign various food processing plants in line with the techniques of dehydration and bulk processing learned in this struggle. You have new materials at hand, including lighter metals than you have ever been able to use before—aluminum in great quantities and at small cost, marvelously efficient insulation, war-tested structural methods for woods in lamination and of and by themselves, myriad new devices for lighting, heating, ventilation—to mention only a few. You face a crying need and a well-financed market. I think that future is something to keep in mind while we bumble through the present darkness.

Soil Conservation and Engineering in the War Period

(Continued from page 42)

come to better understandings, individually and internationally. If land everywhere can be made to produce more with conservation treatment—and there is every reason to believe it can be, generally—one of the principal causes for discontent will have been either removed or improved.

By such action, carried to the ends of the world eventually, one of the basic causes of international strife might be eliminated. Certain it is that other approaches to the proposal of ending wars have led us, 1,942 years after the birth of Jesus Christ, into the most nearly global of all the long bloody lists of wars, and the one that potentially could come nearest to blasting civilization off the earth.

And it will be as well to remember also that no matter how strongly constructed are our farm buildings, or how well a farm may be equipped with the advantages of electricity and machinery, if the soil is permitted to wash away, all of us will have lost our foundation—our basic capital, the source of life. We can replace buildings and machinery, but we *can't* replace productive land.

Therefore, we *must*, at all cost, move ahead determinedly, persistently, with the conservation of productive soil.

Tractors producing Food for Freedom must be kept running . . . You can help by urging farmers to use more efficient fuels, practice Preventive Maintenance.

THE FARMS of America are today a battlefield upon which one of the world's decisive battles is being fought—the battle of food production. We *must* raise enough to feed not only ourselves and our armed forces, but our allies and millions of hungry people in the countries our troops occupy.

To accomplish our production goal in the face of labor and equipment shortages, every piece of farm machinery must be kept running at peak efficiency.

When you overhaul a tractor you are contributing to victory. When you advise a farmer to install high altitude pistons at the time of an overhaul, you are helping him increase production—helping win the battle of food production. Converting to high compression plus gasoline will increase tractor power as much as 30 per cent. And don't forget to point out to farmers who are still burning kerosene or distillate, but whose tractors do not need overhauling, that they can get up to 12 per cent more power by switching to gasoline and making a few minor adjustments, such as installing *cold* type spark plugs and setting the manifold to *cold* position.

Furthermore, you can help keep wartime tractors running by urging farmers to practice Preventive Maintenance. If you can prevent even one breakdown at this critical time you have helped America.

The Ethyl Corporation has published an interesting and helpful book entitled, "High Compression Overhaul and Service." If you have not already received a copy, write to the Agricultural Division, Ethyl Corporation, Chrysler Building, New York, N. Y.—manufacturer of antiknock fluids used by oil companies to improve gasoline.

FARM POWER IS FIGHTING POWER

MAKE EVERY OVERHAUL A HIGH COMPRESSION OVERHAUL

Five Ways to Save Labor and Power in Producing Corn

By Claude K. Shedd
FELLOW A. S. A. E.

THE SUGGESTIONS offered in this paper for saving labor and power in growing corn are substantiated by observations made and experimental results obtained during the past eleven years at Ames, Iowa, in a study carried on cooperatively by the Bureau of Agricultural Chemistry and Engineering (USDA) and the Iowa Agricultural Experiment Station.

Research results indicate five principal ways to save labor and power in producing corn:

1 Overhaul all machines before the working season to eliminate loss of time due to machine failures after field work is started
2 Use combinations of two machines in tandem where practicable for preparing the seedbed
3 Eliminate some customary operations in preparing the seedbed which have been proven unnecessary
4 Cultivate only as deep and as often as necessary to control weeds
5 For harvesting corn with mechanical picker, use large wagons and make wagon hitches and elevator arrangements as convenient as possible.

Preseason overhauling of machinery is a good practice that becomes imperative now that the war makes labor efficiency imperative. This overhauling should be a hunt for trouble; that is, it should include a thorough inspection of the working parts of the machine, cleaning out caked dirt and grease, replacing any parts found to be noticeably worn, and making any needed adjustments to avoid loss of time after the machine is taken to the field.

Under the second point, on the use of machines in tandem, our experience leads us to use a section of rotary hoe with the plow for spring plowing (Fig. 1). By attaching the pull chain off-center on the rotary hoe frame, the hitch may be made to the center of the plow without the use of a hitch bracket. The hoe may be pulled backward, as shown, to reduce its tendency to pick up trash on headlands. The rotary hoe breaks up clods and levels the surface to some extent, thus reducing the loss of moisture in case of dry weather.

For secondary preparation of the seedbed, a combination of tandem-disk harrow and spiketooth harrow (Fig 2) has been found most effective under central Iowa conditions. This combination kills weeds, fills tractor wheel tracks and properly levels off the soil so that the planter may place the seed at uniform depth.

The third point is elimination of unnecessary operations in preparing the seedbed. Where corn has been harvested by machine, we have found that it is not necessary to cut or disk the stalks before plowing. The plow does as good or a better job of handling the trash without any preliminary operation.

In some cases farmers do more than the necessary amount of tillage after plowing. An experiment carried on for five years showed that a single tillage with the tandem-disk harrow and spiketooth harrow combination just before planting was usually sufficient preparation for either fall-plowed or spring-plowed fields. Except under some unusual conditions, no benefits were produced by additional tillage operations.

The fourth point is saving labor and power in cultivating. Many experiments carried on at various stations have shown that the principal purpose of cultivation is to control weeds and that shallow cultivation is usually better than deep cultivation. A cultivator properly equipped with sweeps, or sweeps and disk hillers, will kill practically all weeds at each cultivation.

An experiment carried on for eight years and giving 16 comparisons showed just as good yields and just as good weed control by two cultivations as by three in 12 out of 16 comparisons. It is suggested that an experienced farmer by using good equipment and good judgment as to time of cultivation may often make a saving in number of cultivations.

The last suggestion is to save labor by convenient equipment for hauling and cribbing corn from a mechanical picker.

One time study with a two-row mounted picker and ordinary farm wagons showed that 12.7 per cent of the operating time of the picker was consumed in changing wagons. With 70-bu wagons (Fig. 3) and convenient hitches the time loss in changing wagons was reduced to less than 2 per cent.

In corn yielding 60 to 80 bu per acre and with the usual wagons and portable elevator arrangements used on many farms, it takes two men to haul and crib the corn from a two-row picker. One man does this work without difficulty with larger wagons and more convenient hitches and elevating equipment.

Paper presented December 8, 1942, at the fall meeting of the American Society of Agricultural Engineers at Chicago, Ill. A contribution of the Power and Machinery Division. Author: Agricultural engineer, farm mechanical equipment research division, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture. Journal Paper No. J-1089 of the Iowa Agricultural Experiment Station. Project No. 396.

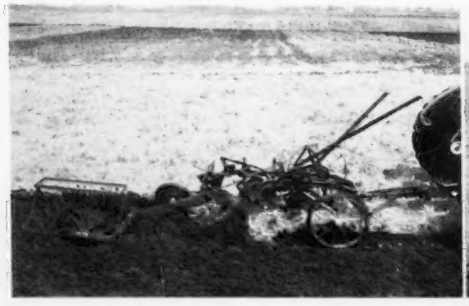


Fig. 1 (Left) For spring plowing, a section of rotary hoe attached to the plow breaks up clods and levels the surface. • Fig 2 (Center) A tandem-disk harrow and spiketooth harrow combination destroys weeds, fills tractor wheel tracks, and levels the soil surface at one operation • Fig 3 (Right) Labor is saved in harvesting corn by using large wagons and convenient hitches

"Howdy Sailor"

It's been a year since these boys have seen each other. They'll have plenty to talk about tonight, and somewhere in their conversation one of them is sure to say something like this:—

"The more I see of how the other fellow does it, Bill, the more I appreciate the good old U. S. A. Why, nobody else in the world has all the things we have—millions of cars, millions of homes owned by the folks who live in them —millions of radios, telephones, electric refrigerators and other things like that—why they're almost as common as tooth paste. No sir, I like the way we've always run things back home—you know—the American way of life."

* * *

Call it what you will—free enterprise, private enterprise, our commercial competitive system, the American brand of freedom, or any one of a dozen other labels, they all help explain the American way of life.

Because of it, we enjoy the world's highest living standards. We work, talk, read, vote, laugh, pray, plan and play pretty much as we please. We advance in life as far as our ambitions, talents and energies allow. We raise our children as we wish. Our homes are our castles. If we don't like our laws and officials we change them without bloodshed. And though wars and depressions still plague us, the flame of our opportunities, hopes and dreams for the future never burned more brightly than now.

Thank the American way of life, too, for making possible the "impossible" war production records being marked up month after month by farm and industry together. Among the millions supporting our fighting forces* are nearly 70,000 Republic men and women.

Armor plate to protect our fliers and tank crews—ship plates in tonnages 500 per cent more than a few months ago—electric furnace alloy steel production 7 times greater than two years ago—parts and assemblies for fighting planes—steel for guns, shells, bombs and other war materiel are pouring from Republic mills with all the record-smashing speed and fury that free men can put into the job.

The American way of life will be a decisive factor in winning the war. Let's guard it faithfully.

**Nearly 12,000 Republic men are now enrolled in the Armed Forces.*

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NEWS SECTION

A.S.A.E. Meetings Calendar

June 21 to 23—Annual Meeting, Purdue University, Lafayette, Ind.

December 6 to 8—Fall Meeting, La Salle Hotel, Chicago, Ill.

A.S.A.E. War Activities

PRESIDENT H. B. Walker of the AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS has appointed a special War Activities Committee to make available to government agencies the technical resources of the Society, especially practical data and information on problems dealing with the war emergency coming within the agricultural engineering field. The Committee consists of A. W. Turner (chairman), R. W. Carpenter, L. J. Fletcher, A. N. Hemker, L. F. Livingston, R. M. Merrill, and J. F. Schaffhausen. The Committee held meetings recently in New York and Washington and has under way several timely projects related to the war effort. Pertinent suggestions relative to its activities will be welcomed by the Committee.

Farm Structures Bill Re-introduced in Congress

IN March 1941 Senator Caraway of Arkansas introduced a bill in the United States Senate "to provide for better rural homes and farm structures through further endowment of cooperative agricultural extension work, agricultural research, and resident instruction in the land-grant colleges." It will be of particular interest to agricultural engineers, especially those engaged in farm structures work, to learn that this bill has recently been reintroduced, without change, and is now known as Senate bill S.75.

Title I of the bill provides for an appropriation for cooperative agricultural extension work of one million dollars for the first year and for an increase of one million dollars each year thereafter until the total annual appropriation has reached the sum of five million dollars per year. Title II provides for an annual appropriation of one million dollars for research "with respect to the utility, economy, safety, and appearance of rural homes and farm structures and their equipment, the utilization of local and native materials and of the available time and latent skill of farm people for the improvement of rural homes and farm structures, and the adaptation and application of industrial products, power tools, and improved methods to rural building requirements," the research to be conducted by the agricultural experiment stations. Title III of the bill provides for an annual appropriation of $265,000 for resident instruction in the land-grant colleges "to meet their responsibilities in providing adequate training for field work and research in the improvement of rural homes, farm structures, and their equipment."

The Caraway Bill also provides that the administration of the proposed act shall be by the Secretary of Agriculture.

Conference on Sweet Potato Research

A CONFERENCE on sweet potato research problems, in which southern agricultural engineers, animal husbandmen, and horticulturists will participate, was held February 3 and 4 at the Alabama Polytechnic Institute. Members of the American Society of Agricultural Enginers who contributed to the program of this conference are as follows: J. W. Randolph, agricultural engineer, Bureau of Agricultural Chemistry and Engineering, USDA, F. A. Kummer, associate agricultural engineer, Alabama Polytechnic Institute; Ray Crow, sales promotion engineer, Tennessee Coal, Iron and Railroad Co.; J. A. Schaller, agricultural engineering development division, Tennessee Valley Authority; H. T. Barr, head, agricultural engineering research division, Louisiana Agricultural Experiment Station; Douglas Warriner, president, Warriner Starch Co., Inc.

Personals of A.S.A.E. Members

W. H. Farmer is now associate irrigation engineer with the Guayule Emergency Rubber Project at Salina, California, which is under the direction of the Forest Service of the USDA. Mr. Farmer's previous position was that of associate civil engineer of the Farm Security Administration.

(Continued on page 56)

Personals of A.S.A.E. Members

(Continued from page 54)

Kenneth R. Frost recently resigned as instructor in agricultural engineering at the Modesto (Calif.) Junior College to accept appointment as assistant professor of agricultural engineering and assistant engineer in the Agricultural Experiment Station at the University of Idaho. His new work will include both teaching and research in agricultural engineering.

L. W. Garver, formerly branch manager, Massey-Harris Co., at Batavia, New York, was recently transferred to the company's home office at Racine, Wis., where he was made supervisor of the newly established department of inventory control and priorities. The function of the department is to assist the company in operating to the best of its ability in the contribution it is making to the war effort and as directed by governmental agencies.

Andy T. Hendrix is now associate agricultural engineer at the Soil Tillage Machinery Laboratory of the USDA Bureau of Agricultural Chemistry and Engineering at Auburn, Alabama. For a number of years he was on the agricultural engineering staff of the University of Tennessee, and more recently has been assistant professor of agricultural engineering at North Carolina State College.

Oscar H. Lowery who has been serving as a junior engineer in the construction division, Engineer Corps, U. S. War Department, recently accepted appointment as instructor in agricultural engineering at Iowa State College.

Karl H. Norris formerly an engineering draftsman of the International Harvester Co., is now instructor in the Signal Corps School of the U. S. Army at the University of Chicago.

C. B. Richey and *R. D. Barden,* members of the agricultural engineering staff of Ohio State University, are joint authors of a publication, entitled "Buck Rakes," (revised December 1942) recently issued by that institution. The publication includes plans for building and equipping these rakes.

D. E. Washburn, assistant agricultural engineer, Tennessee Valley Authority, is author of a publication, entitled "Electric Poultry Equipment for the Farm," recently prepared by the agricultural engineering division of TVA as a part of their co-operative rural electrification educational program with the agricultural agencies of the states in which TVA operates.

S. J. Wright is director of the National Institute of Agricultural Engineering established early in 1942 by the Agricultural Machinery Development Board of Great Britain and set up at Askham Bryan, near York. The nucleus of the institute is the Institute of Research in Agricultural Engineering, transferred from Oxford University, the directorship of which Mr. Wright has held for some time. The main function of the new institute will be to act as a general clearing house for information about agricultural machinery and its use, to carry out tests or demonstrations of new or improved implements, and to undertake experimental and demonstration work on the better utilization of existing equipment.

Necrology

A. LINCOLN FELLOWS, consulting engineer in irrigation and drainage work, recently passed away at his home in Denver.

Mr. Fellows was a native of Maine and received his early education in the public schools of New England, graduating from Yale University in 1886.

He went to Colorado in 1887 and for a period of several years he served as engineer in charge of the Montezuma Valley's irrigation system. Following a short period of service with the U. S. Geological Survey, he became deputy state engineer of Colorado but later re-entered the federal service as resident engineer in charge of the hydrographic and irrigation system. In 1902 when the U.S.D.I. Reclamation Bureau was established, he became a division engineer.

For a time Mr. Fellows was associated with a firm of consulting engineers in Colorado, and when the public utilities commission was created, he was named one of the three commissioners. In 1918 he entered the service of the U.S.D.A. Bureau of Public Roads, and when the Bureau of Agricultural Engineering was organized, he transferred to the irrigation division of that Bureau.

Mr. Fellows' professional achievements included several written works, "Water Resources of the State of Colorado," "Measurement of Water," and others.

He is survived by Mrs. Fellows, a son, and two daughters.

CLARK ELLSWORTH JACOBY, drainage engineer, Soil Conservation Service, U. S. Department of Agriculture, passed away the latter part of August, 1942, at his home in Milwaukee, Wisconsin.

Mr. Jacoby was a native of Kansas. *(Continued on page 58)*

Necrology

(Continued from page 56)

He received his early education in the public schools of Iola, Kansas, and then attended Lane University and later Kansas University of Lawrence, where he received the degree of bachelor of arts in 1905.

Mr. Jacoby began his engineering career in 1903, specializing in land drainage and flood control problems, and he engaged in private practice as a consulting engineer until May 1935 when he became associated with the U.S.D.A. Bureau of Agricultural Engineering as a consultant and inspector for land drainage work of the CCC Camps in Missouri and Illinois. He was transferred to the Soil Conservation Service in 1938 and established headquarters at Milwaukee where he assumed charge of the SCS drainage division activities in the states of Minnesota, Wisconsin, Illinois, Missouri, and Iowa, in which capacity he remained until his passing.

Mr. Jacoby was outstanding in his ability to make friends, and he was highly respected by his associates. His untiring energy and application to his work contributed much to the success attained on projects with which he was connected. He is survived by Mrs. Jacoby and a son, Ellsworth R. Jacoby, a graduate of West Point Military Academy and commissioned a major in the U. S. Army Air Force.

Gold-Star A.S.A.E. Members

JOHN E. COTTINGHAM, JR., second lieutenant, Infantry, USA, was killed in action last November. Lieutenant Cottingham was a Junior Member of A.S.A.E. and a graduate in agricultural engineering from Clemson Agricultural College in 1941.

JAMES F. MCCAY, first lieutenant, Air Force, USA, was killed in action in India early in January. He was in service with a ferry group of the Army Air Force. He was a graduate in agricultural engineering of the University of Georgia.

Applicants for Membership

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Paul O. Esmay, engineer, in charge of farm machinery development, Sears, Roebuck & Co. (Mail) 171 Evergreen, Elmhurst, Ill.

George H. Foster, assistant, agricultural engineering dept., Purdue University, Lafayette, Ind.

Lawrence H. Hodges, USA. (Mail) RR S, Tulia, Tex.

Emmett R. Holekamp, RR. No. 1, Box 60, Comfort, Tex.

John K. Kimbro, USA. (Mail) RR No. 7, Box 385, Fort Worth, Tex.

Brownie J. Merrill, Jr., USA. (Mail) P. O. Box 24, Desdemona, Tex.

John W. Otto, Jr., P. O. Box 184, Needville, Tex.

Lowell Stoddard, aircraft mechanic student, USA. (Mail) RR No. 3, Opelika, Ala.

Willie L. Ulich, lt., USA. (Mail) Lyons, Tex.

William S. Woods, pvt. air force enlisted reserve, USA. (Mail) RR No. 1, Maumee, Ohio.

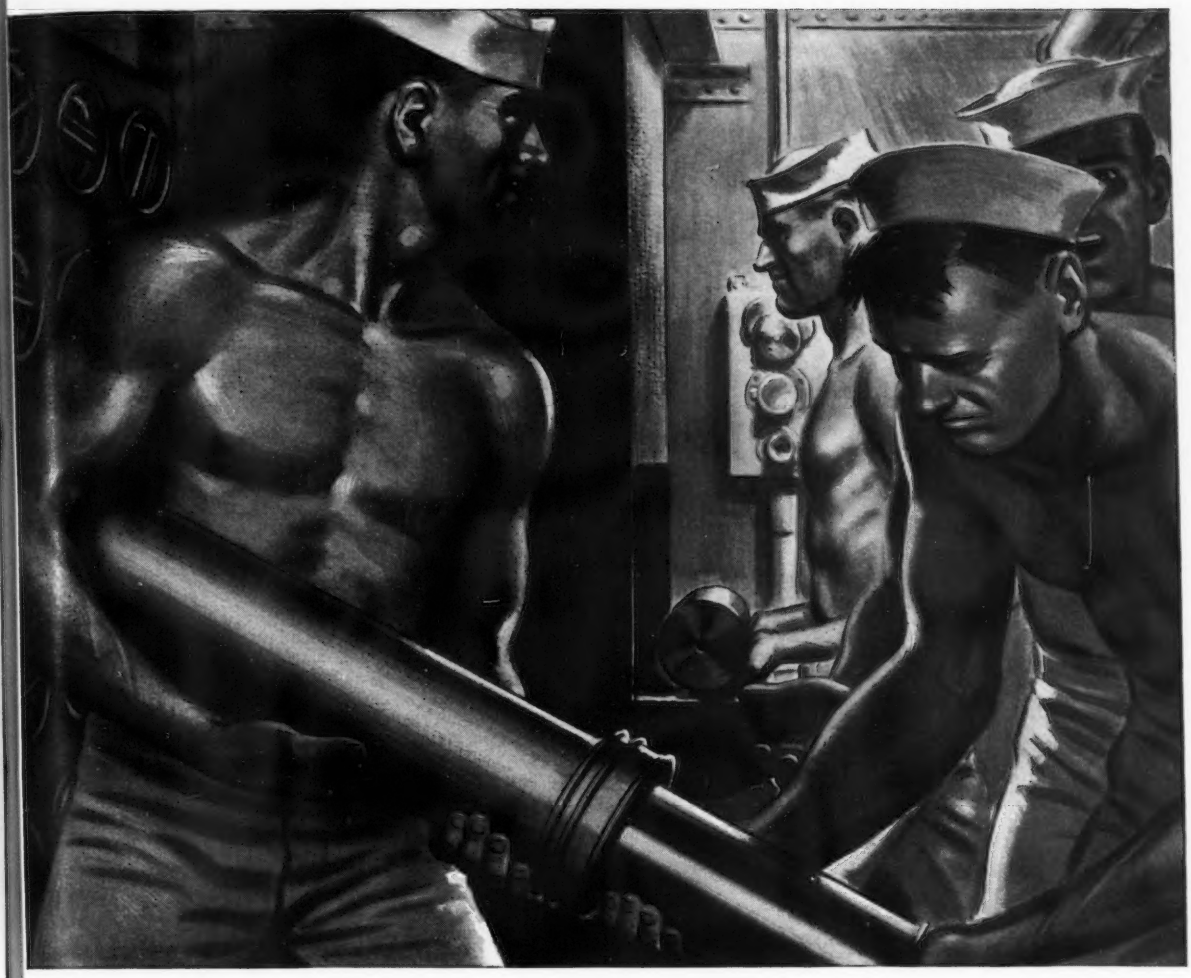
TRANSFER OF GRADE

L. W. Garver, supervisor, inventory control and priorities, The Massey-Harris Co., Racine, Wis. (Junior Member to Member)

Lloyd E. Hightower, instructor in agricultural engineering, University of Missouri, Columbia, Mo. (Junior Member to Member)

William E. Hudson, 1st Lt., Troop A, 15th Cav., USA. (Mail) University of Georgia, Athens, Ga. (Junior Member to Member)

R. R. Poynor, instructor in agricultural engineering, Purdue University, Lafayette, Ind. (Junior Member to Member)



Smashing the enemy—and broadening your future

Upon deck, antiaircraft guns are going full blast! Below, husky sailors are passing the ammunition. The cartridges used in the big sky-guns are protected by sheet steel cases till they go to the gun crew. These cases were once made from a more critical metal by forming the body and casting the ends. Now they are formed entirely from sheet steel. On one order alone this has saved *68 years* of machine hours.

Today ARMCO's Research Laboratories are being called upon to develop unheard-of properties in *special-purpose* steels. These sheet metals, now proving their value in war, will some day be used by agricultural engineers to design lighter, stronger, more efficient farm machinery, metal buildings and barnyard equipment.

Your post-war opportunities will be almost unlimited. For instance, there is a great need for improved designs in metal buildings. Those of the future will be based on functional requirements that horses and cattle, hogs, sheep and poultry must have for health and efficiency. Each structure will be planned to save the farmer's time and money.

When Victory comes, you will have better metals to work with. For developments and improvements that would normally take *years* are being accomplished in *months* under the forced draft of war. The American Rolling Mill Company, 351 Curtis Street, Middletown, Ohio.

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SPECIAL PURPOSE ★ ARMCO ★ SHEET METALS

Student Branch News

GEORGIA

By Dan Harrell, *Scribe*

THE Georgia Student Branch of the American Society of Agricultural Engineers held its regular meeting on November 23, in its clubroom in Barrow Hall, University of Georgia, the meeting being presided over by President D. L. Payne.

The social committee reported that it appeared undesirable to hold a sociable during the fall quarter, due to transportation facilities, the inability to obtain a dance hall, and the fact that other activities had pretty well filled the calendar of events for the remainder of the quarter.

The scrap iron committee reported that approximately $25.00 had been raised by the collection and sale of scrap metal.

The program of the evening consisted of a motion picture presented by representatives of Harry Ferguson, Inc., of Atlanta. This picture depicted the speeding up of farm programs wherein tractors played an important part.

At the last meeting of the quarter on December 7, a lengthy discussion was held pertaining to the publication of the Georgia "Ag Engineer." The editor, Irby Exley, and the business manager, David Firor, informed the Branch that due to lack of advertising it would be nearly impossible to publish as large an annual as had been published in the past. It was the opinion of the members, however, that as large an annual as possible should be published and all members of the Club agreed to cooperate in making this possible.

The program of the evening consisted of a talk by Prof. Tyus Butler of the school of journalism, in which he discussed the importance of journalism to a nation at war, and what part it will play in the peace that is to follow.

The following were elected as officers of the Branch for the winter quarter: Dan Harrell, president; E. P. Pullen, vice-president; Doyle Merritt, secretary, and R. E. Skinner, scribe.

We are looking forward to continued success during the coming year.

New Literature

"Electrical Poultry Equipment for the Farm," by D. E. Washburn, assistant agricultural engineer, Tennessee Valley Authority. Paper, 8½x11 inches, 70 pages, 92 figures. 50 cents. Tennessee Valley Authority, Knoxville, Tenn.

This book is the result of efforts to provide condensed practical information on electric poultry equipment. It is the third in a series of proposed leader-training courses in rural electrification, the first being "Wiring and Lighting the Farmstead" and the second "Plumbing for the Farmstead." It was prepared by the agricultural engineering development division of TVA as a part of their cooperative rural electrification educational program with agricultural agencies in the region in which the TVA operates. It is being used as a textbook along with laboratory and demonstration equipment. While some of the equipment described in the publication cannot be obtained on account of the war, the book, however, has value in training agricultural workers in the fundamentals of electric poultry application so that equipment now on farms may be put to best use in increasing poultry production. The book contains the following chapter headings: Electric Brooders, Management and Operation of the Hover-Type Brooder, Electric Incubators, Lights in Poultry and Egg Production, Feed Processing Equipment and Water Warmers, Poultry Dressing and Egg Storage Equipment, and Poultry House Wiring and Alarm Systems. It also contains an appendix on suggestions for homemade equipment and a bibliography on poultry and poultry equipment for the farm.

"Explosives in Agriculture, Lumbering, Forestry." Paper, 6x9 inches. 60 pages, thoroughly illustrated. Copy sent on request to Atlas Powder Co., Wilmington, Delaware.

This new publication gives detailed instructions on the use of explosives for ditching, rock and boulder blasting, and stump blasting in agriculture, lumbering, and forestry. The usefulness of the book is not limited to these fields, as many of the problems discussed are met with on construction jobs and in army demolition work. In addition to the material on ditching with explosives, rock and boulder blasting, and stumping, there is information on soil blasting, gully control, land clearing, and fire control, and a general discussion of explosives and the principles upon which they work is included.

Agricultural Engineering Digest

A review of current literature by R. W. TRULLINGER, assistant chief, Office of Experiment Stations, U. S. Department of Agriculture. Copies of publications reviewed may be procured only from the publishers at the addresses indicated.

OBSERVATIONS ON USE OF IRRIGATION WATER IN COACHELLA VALLEY, CALIFORNIA, *A. F. Pillsbury*. California Ag. Exp. Sta. (Berkeley), Bul. 649 (1941). The work reported indicates that the local irrigation practices in the area studied supply water in excess of the needs of the plants grown and that the excess is largely lost by drainage below the root zone. The study was concerned mainly with soils planted to date and grapefruit trees and grapevines. It appears that from 4 to 7 in of water can be stored in dry soils so planted in the Coachella Valley, without loss of excessive amounts by drainage. This would require application of from 5 to 9 in depth. Frequency of irrigation can be estimated from the average monthly use shown in the tables, included in this bulletin, in conjunction with the application per irrigation.

The relative rates at which moisture is removed at various depths indicate that an average of about 90 per cent of the effective roots of dates are in the first 4 ft below a 5-in mulch. An average of 60 per cent is in the first 2 ft. Of grapefruit from about 85 to 95 per cent of the roots appeared to be in the top 4 ft below a 5-in mulch. Of grapes about 65 per cent of the roots, in the plat investigated, were in the first 3 ft of soil below the 5-in mulch. About 95 per cent were in the first 6 ft. Irrigation efficiency being assumed to be 80 per cent, the respective total annual applications of water required by these crops are estimated as 7.5, from 5 to 7, and 4.5 ft of water. Some drainage is believed to be necessary to prevent toxic salt accumulations, but, in general, more than the necessary quantities of water appeared customarily to be used.

HOMEMADE RUBBER TIRED WAGONS AND TRAILERS, *H. H. DeLong*. South Dakota Ag. Exp. Sta. (Brookings), Bul. 349 (1941). This bulletin briefly describes a two-wheeled trailer, a rubber-tired farm wagon, a rubber-tired wagon with hydraulic lift, a heavy duty dual-wheeled trailer, and a caster-wheel trailer, all being constructed from old car parts. Photographs and diagrammatic drawings show the vehicles made and some mechanical principles important in their successful design and operation. Used car wheels, axles, frames, and entire chassis gave good results. The 6-16 drop center rim welded to the old car wheel or hub was the most satisfactory size of tire rim. It holds a tire (1) sufficiently large for loads, (2) large enough for cushioning much of the road shock, and (3) easily and cheaply obtained. The wagon type of steering gave better trailing performance than the auto-type steering, for fast road speeds. The two-wheeled light-car trailer gave best results when the load was balanced over the axle, and with a long tongue than with a short one. The common car hydraulic bumper jack proved adequate for the lift mechanism on farm trailers. The one-wheel caster-wheel trailer is suitable only for light loads up to 600-700 lb. This type of trailer was made both without springs and with a hinged fork-spring mounting.

In gasoline mileage tests at 30 miles per hour the two-wheel trailer with a 2,900-lb load took 7 per cent more fuel than for the car alone, and the four-wheel trailer with a 5,470-lb load took 22 per cent more fuel than for the car alone. Similar mileage tests at this and at higher and lower speeds were made on all the trailers described.

AGRICULTURAL ENGINEERING INVESTIGATIONS AT THE NEBRASKA STATION. (Partly coop. USDA) Nebraska Ag. Exp. Sta. (Lincoln), Rpt. (1940). This report records tractor testing, adaptation of small electric motors to farm use, and study of automatic water systems, of electrically operated refrigerators for farm use, of water heating for livestock, of mechanical equipment for the eradication of bindweed, of insulated electric brooders in uninsulated poultry houses, and of oil filters for internal combustion engines; and pump-irrigation work at the North Platte Substation.

DESIGN OF SMALL IRRIGATION PIPE LINES, *M. R. Lewis*. (Coop. USDA) Oregon Ag. Exp. Sta. (Corvallis), Cir. 142 (1941). This circular is concerned mainly with determination of the most economical pipe size for a given required discharge rate, the factors pointed out as most important being electric-power cost, over-all pumping-plant efficiency, pumping hours per season, pipe cost, and tax, interest, and depreciation rates. The circular contains three charts, all based on the formula for calculating friction head, $H=0.34(V^{1.9}D^{1.1})$ for steel pipe from 4 to 6 years old, from which saving in friction head per 100 ft of pipe by substituting the next larger pipe size, the friction head in feet per 60 ft of pipe at from 6 to 400 gpm discharge rate from pipe 0.75-in standard size to 6-in outside diameter, and the same per 40 ft of pipe may be, respectively, read off; and tables giving, respectively, cost of energy for pumping in cents per foot-acre-foot and annual cost of pumping in cents per gallon-per-minute-foot unit. Wtih respect to the last-named *(Continued on page 64)*

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(Continued from page 62)

unit, it is noted that it differs from the foot-acre-foot unit in that it is a rate of flow times a head rather than a volume times a head, and that it is here used to express the product of the discharge rate through a given line times the friction head in the pipe.

THE WORK OF THE UNITED STATES COTTON GINNING LABORATORY. U. S. Dept. Agr., (Washington), Misc. Pub. 445 (1941). This is a mainly popular account of the purpose, equipment, and accomplished work of the ginning laboratory. The study of the cotton before ginning has shown that trash brought in by careless picking may cause losses of as much as $5 per bale and that the most complete cleaning equipment does not entirely offset the results of careless picking. Development of mechanical driers which increase the value of the ginned lint by from 70c to $2.50, according to staple length, at a fuel cost often less than 15c per bale, is mentioned, together with increases up to nearly 20 per cent in gin capacity brought about by raising saw speeds from 400 to 600 rpm at a cost negligible in comparison with the gain in value of the cotton gin, which may be obtained from this change and from the concomitant use of looser seed rolls. Study of the effects of variations in gin-saw design and the importance to proper doffing of keeping the brush drums and brushes in good repair are also taken up, as are packaging improvements, pure-seed handling equipment, reduction in power wastes, etc.

EMPLOYMENT BULLETIN

The American Society of Agricultural Engineers conducts an employment service especially for the benefit of its members. Only Society members in good standing may insert notices under "Positions Wanted," or apply for positions under "Positions Open." Both non-members and members seeking to fill positions, for which ASAE members are qualified, are privileged to insert notices under "Positions Open," and to be referred to members listed under "Positions Wanted." Any notice in this bulletin will be inserted once and will thereafter be discontinued, unless additional insertions are requested. There is no charge for notices published in this bulletin. Requests for insertions should be addressed to ASAE, St. Joseph, Michigan.

POSITIONS OPEN

AGRICULTURAL ENGINEER to teach farm shop, farm engines, and soil erosion control, in a southern college. Salary up to $2700, depending upon qualifications. Persons interested may submit full particulars regarding training and experience to PO-142.

RESEARCH ENGINEER wanted for design and development of agricultural machinery and equipment for the Southeast. Salary up to $3,000, depending on qualifications. Persons interested are requested to write giving full particulars regarding training, experience, and other pertinent information. PO-141.

RESEARCH ENGINEER wanted to fill position at Virginia Agricultural Experiment Station, at salary up to $3200 to start. Agricultural engineer wanted to do research in rural electrification field. Present project includes egg cooling as a wartime activity in cooperation with U.S.D.A. Applicants should submit complete personnel record to Chas. E. Seitz, head, agricultural engineering department, Virginia Polytechnic Institute, Blacksburg, Va.

AGRICULTURAL ENGINEERS wanted. ASAE headquarters understand that one of the Bureaus of the USDA is greatly in need of agricultural engineers. They can use two or three engineers each of the Junior and Assistant grades, and will probably need more at a later date. If interested, write ASAE, St. Joseph, Mich.

ENGINEERS urgently wanted by federal government to fill important positions in all branches of engineering essential to the war effort. The positions range from the grade of junior engineer at $2,000 a year, with no experience requirement, through various grades to that of chief engineer at $8,000 a year. Requirements have been greatly modified in an effort to secure additional appointees. There are no age limits, and no written test will be given, as applicants will be graded on their education and experience as shown by their applications. The employing agencies contemplate filling vacancies in Washington, D. C., throughout the United States, and in its territories and possessions. Applications and complete information may be obtained from the U. S. Civil Service Commission, Washington, D. C.

POSITIONS WANTED

AGRICULTURAL ENGINEER with a B.S. degree in engineering, majoring three years in civil engineering and two years in agricultural engineering, seeking employment. Nine years' experience with U. S. Soil Conservation Service doing drainage and soil conservation work. Also has some manufacturing, material inspection, and construction experience. Thirty-six years of age, married. Draft status 3-A. PW-351